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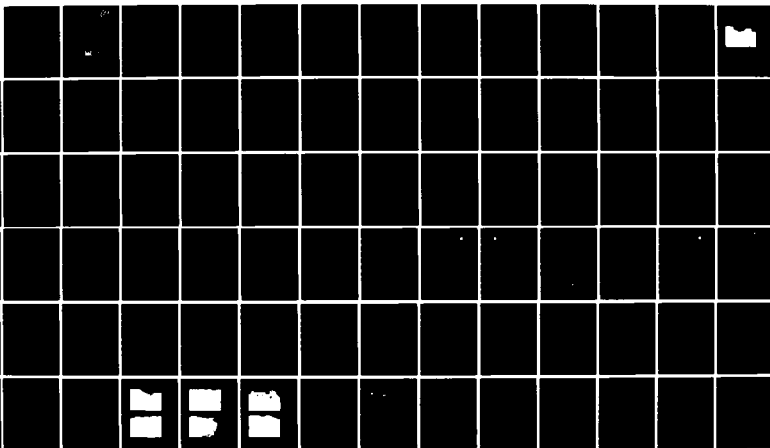
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
COACHLACE POND DAM (M. (U) CORPS OF ENGINEERS WALTHAM
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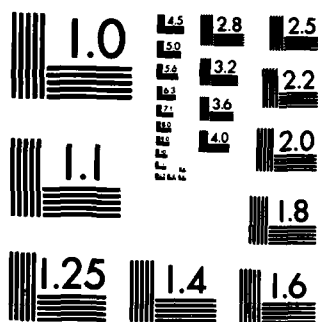
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NASHUA RIVER BASIN
CLINTON, MASSACHUSETTS



COACHLACE POND DAM
MA 00106

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

OCTOBER 1978

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9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Nashua River Basin Clinton, Massachusetts		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Coachlace Pond Dam is a 440 foot long, 13 foot high earthfill dam with a stone wass along the top of most of the upstream slope. The dam is considered to be in fair condition. It has been placed in the "significant" hazard category for the classification of hazard potential. An outflow test flood 2,010 cfs will overtop the dike by a maximum of 3.0 feet, but will not overtop the dam.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF

NEDED

FEB 13 1975

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

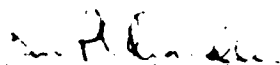
I am forwarding to you a copy of the Coachlace Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Lancaster Engineering Company, Inc., 55 Sterling Street, Clinton, Massachusetts 01510.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

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COACHLACE POND DAM
MA 00106

NASHUA RIVER BASIN
CLINTON, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION
PROGRAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

BRIEF ASSESSMENT

Identification No.: MA00106

Name of Dam: Coachlace Pond

Town: Clinton

County and State: Worcester County, Massachusetts

Stream: Counterpane Brook - Tributary of Nashua River

Date of Inspection: September 7, 1978

Coachlace Pond Dam is a 440-foot long, 13-foot high earthfill dam with a stone wall along the top of most of the upstream slope. The dam was built in 1846, the spillway and outlet works were added in 1881, and subsequently, two merging roadways have been built on the crest of the dam. The spillway is a 21.7 foot long, ungated weir with vertical I-beams forming four bays for flashboards. The spillway is located at the northwest abutment of the dam and has a crest elevation (El) of 329.5. The outlet works at the dam include gate house A adjacent to the spillway, two outlet conduits, and gate house B downstream from the dam. The outlet conduits are 20 and 24 inches in diameter and lead to mill buildings. There is a bypass from the 24-inch outlet conduit to the channel downstream of the spillway. There is also an earth dike about 900 feet long and 1.4 feet high on the northeast shore of the pond. The crest of the dike is at El 333.0 which is lower than the crest of the dam. Coachlace Pond is the most downstream in a series of three interconnecting ponds.

There are deficiencies which must be corrected to assure the continued performance of this dam. This conclusion is based primarily upon the visual inspection of the site, a review of available engineering data, and evidence of limited operating and maintenance procedures. The dam is considered to be in fair

COACHLACE POND DAM

condition. It has been placed in the "significant" hazard category, according to the Corps of Engineers guidelines for the classification of hazard potential.

The following are visible signs of distress which indicate a potential hazard at the site: deterioration of the brick service building over the spillway, seepage from the downstream face of the spillway and from both side walls, severe erosion of the mortar facing on the side walls of the spillway channel and approach channel to the gate house, growth of trees and brush in the floor of the spillway channel and on the upstream face of the dam, lack of access to gate house A, lack of suitable access to gate house B, possible leakage from gates in gate house B, and erosion in areas on the upstream face of the dam.

Hydraulic analyses indicate that the spillway can discharge an estimated 380 cubic feet per second (cfs) when the pond level is at El 333.0 which is the crest of the dike. An outflow test flood of 2,010 cfs will overtop the dike by a maximum of 3.0 feet, but will not overtop the dam. The spillway can discharge only about 19 percent of the test flood before overtopping the dike.

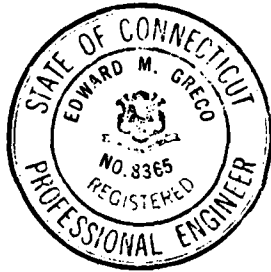
It is recommended that the Owner employ the services of a qualified consultant to review existing hydraulic data and evaluate raising the earth dike, constructing an emergency spillway, and/or removing the railroad spur across the channel downstream of the spillway. A consultant should also investigate the condition of all outlet works structures, provide recommendations on repair of gates and other facilities, and design an adequate regulating outlet for the dam.

In addition, the Owner should also accomplish the following: remove the service building over the spillway, remove the I-beams from the crest of the spillway, grout stonework beneath the crest of the spillway and at both side walls and resurface them with mortar, resurface the side walls of the spillway channel and approach channel to gate house A, clear trees and brush from the floor of the spillway channel and from the upstream face of the dam, and backfill eroded areas on the upstream face of the dam and protect those areas with riprap. The Owner should

COACHLACE POND DAM

also implement a systematic program of inspection and maintenance.

The recommendations and remedial measures described in Section 7 should be implemented by the Owner within a period of 2 years after receipt of this Phase I Inspection Report. An alternative to these recommendations would be draining the reservoir and breaching or removing the dam.



A handwritten signature in dark ink, appearing to read "Edward M. Greco", written over a horizontal line.

Edward M. Greco, P.E.
Project Manager
Metcalf & Eddy, Inc.

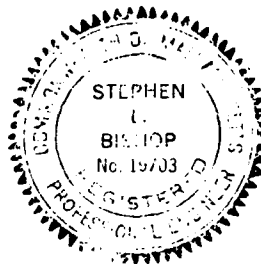
Connecticut Registration
No. 08365

Approved by:

A handwritten signature in dark ink, appearing to read "Stephen L. Bishop", written over a horizontal line.

Stephen L. Bishop, P.E.
Vice President
Metcalf & Eddy, Inc.

Massachusetts Registration
No. 19703



COACHLACE POND DAM

This Phase I Inspection Report on Coachlace Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials
Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL C. COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

COACHLACE POND DAM

PREFACE

This report is prepared for guidance contained in Recommended Guidelines for Safety Inspection of Dams, for a Phase I Investigation. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environmental of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

COACHLACE POND DAM

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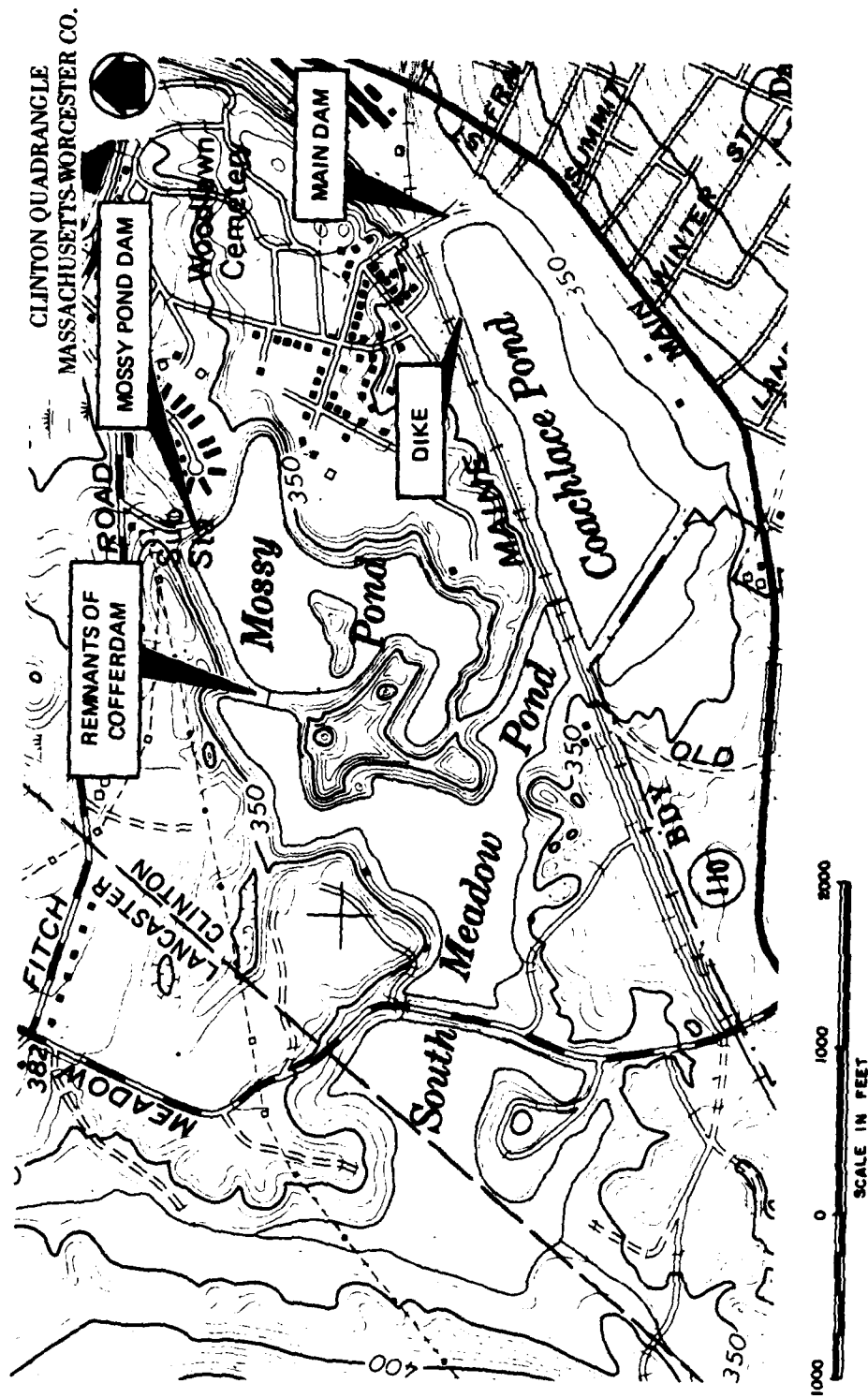
COACHLACE POND DAM

**OVERVIEW
COACHLACE POND
CLINTON, MASSACHUSETTS**



VIEW FROM UPSTREAM OF SOUTH ABUTMENT

**Location and Direction of Photographs
Shown on Figure in Appendix B**



LOCATION MAP - COACHLACE POND DAM

NATIONAL DAM INSPECTION
PROGRAM

PHASE I INSPECTION REPORT

COACHLACE POND

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Metcalf & Eddy, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Metcalf & Eddy, Inc. under a letter of July 28, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW 33-78-C-0306 has been assigned by the Corps of Engineers for this work.

b. Purposes

- (1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.
- (2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.
- (3) Update, verify and complete the National Inventory of Dams.

COACHLACE POND DAM

1.2 Description of Project

- a. Location. The dam is located in the Town of Clinton, Worcester County, Massachusetts, on Counterpane Brook, a tributary of the Nashua River (see Location Map and Figure D-1, Drainage Area Map).
- b. Description of Dam and Appurtenances.

Coachlace Pond Dam is an earthfill dam with a granite block wall along part of the upstream face (see Figures B-1 and B-2). The dam is approximately 440 feet long and has a maximum height of 13 feet near the spillway. The crest of the dam consists of New Harbor Road which forms a Y-intersection with Franklin Street near the southeast abutment. The width of the crest is generally 34 feet and widens to 185 feet at the southeast abutment. The elevation of the crest is generally 339.6 to 343.3, but is higher near the abutments where the crest meets a steep hill to the southeast and a bridge to the northwest. The upstream face of the dam consists of a granite block wall about 1.5 feet high at the top of the slope with a 2:1 (horizontal: vertical) earth slope at the bottom. The granite wall ends near the intersection of New Harbor Road with Franklin Street, and the remaining upstream face is an earth slope at 2.7:1. The downstream face is an earth slope at 1.5:1 to 2.0:1.

The spillway is located at the northwest abutment of the dam about 65 feet upstream of New Harbor Road. The crest is constructed of asphalt-covered stone masonry with 4 bays separated by 6-inch vertical I-beams installed to hold flashboards. The gross length of the spillway is 24.1 feet, and the available clear span between the beams totals 21.7 feet. The crest of the spillway is at El 329.5. Downstream of the crest, the surface of the spillway slopes at 5:1 for a distance of 5 feet, then is level for a distance of 1.8 feet, and then drops vertically about 2 feet to the stream bed.

Above the spillway is a brick service building supported by a brick arch, whose crown is

COACHLACE POND DAM

10.2 feet above the crest. The service building contains a wood frame for hoisting flashboards and an opening in the floor for access to the flashboards. The approach to the spillway is a 24-foot wide, 100-foot long channel with vertical side walls made of granite blocks or dry-stone masonry faced with mortar. The walls extend from the service building 64 feet upstream and range in height from 10.7 feet at the spillway to 5.5 feet upstream. The upstream portion of the channel has earth slopes. The entrance to the channel contains a trash rack, and 25 feet downstream are two manholes for a sewer located in the middle of the channel. The channel downstream of the spillway is 24 feet wide for a distance of 57 feet. The side walls are vertical, made of dry-stone masonry faced with mortar, and about 13 feet high. The floor of the channel is bedrock which slopes up and into the side walls. From 57 to 135 feet downstream of the spillway, an abandoned railroad spur crosses the channel diagonally about 2.5 feet above the stream bed. A manhole for a sewer is also located in the middle of the channel just upstream of the railroad spur. A steel bridge on Old Harbor Road passes over the railroad spur about 19 feet above the stream bed (see profile on Figure B-2). The channel downstream of the railroad spur is 24 feet wide and 3 to 8 feet deep. The channel consists of vertical dry-stone masonry walls with the floor on bedrock. This channel continues about 650 feet downstream to a mill on Main Street.

The outlet works consist of gate house A with an inlet from the pond, two outlet conduits, and a second gate house B downstream. The upstream gate house is a brick building located adjacent to the spillway. The inlet from the pond is 38 feet long and 20 to 22 feet wide with vertical side walls 14 to 16 feet high made of dry stone masonry faced with mortar. At the pond end of the inlet is a metal frame with two bays 6.4 feet wide and 12.6 feet high.

At gate house A, there is a rectangular opening 16.2 feet high and 2.6 feet wide with an

COACHLACE POND DAM

invert at El 323.8. A drawing dated August 9, 1881 shows that two outlet conduits originate inside gate house A and are controlled by gates. The conduits are shown to be 36 inches in diameter, but 20-inch and 24-inch cast-iron pipes were reportedly installed. The conduits follow the southeast wall of the channel downstream of the spillway for a distance of about 200 feet to gate house B. This building is made of brick with a hole in the northeast wall for access. There are 5 gate valves inside, and the Owner states that these control flow through the conduits and flow into a 24-inch by-pass conduit which discharges into the channel of Counterpane Brook farther downstream. The gate valves have gears at the top, but are missing an operating mechanism. The 20 and 24-inch outlet conduits continue downstream to mill buildings on Main Street and Union Street in Clinton (see Figure B-5).

An earth dike about 900 feet long and 1.4 feet high has been constructed just upstream of the approach channel to the spillway (see Location Map). The dike is built along the Boston and Maine Railroad. The dike has a nominal crest less than 1 foot wide which is at El 333.0 to 334.8 (see Figure B-3). The side slope toward the pond is about 4:1 and toward the tracks the slope is about 9:1.

An earth dam about 280 feet long and 14 feet high is located along the north end of Mossy Pond (see Location Map). The crest is 21 feet wide and varies from El 343.0 to 344.6 (see Figure B-4). The upstream slope is 1.8:1 and the downstream slope 3.3:1. There is no outlet or spillway at the dam.

- c. Size Classification. Coachlace Pond Dam is classified in the "small" category because it has a maximum height of 13 feet and a maximum storage capacity of approximately 186 acre-feet in the immediate area of Coachlace Pond and approximately 670 acre-feet including South Meadow and Mossy Ponds.
- d. Hazard Classification. The dam is located about 900 feet from mill buildings and other commercial areas of Clinton. Due to the high

COACHLACE POND DAM

elevation of the downstream toe of the dam, it is unlikely that failure of the dam could occur. With a water surface at El 333.0, corresponding to the top of the dike, the head on the pond is low. In the event the dam or dike fails, it is unlikely that more than a few lives could be lost or that more an appreciable amount of damage could occur. Accordingly, the dam is placed in the "significant" hazard category.

- e. Ownership. The dam is owned by Lancaster Engineering Company Inc., 55 Sterling Street, Clinton, Massachusetts 01510. Permission to enter the property and inspect the dam was granted by Mr. John J. Gannon, Jr. (telephone 617-365-2469).
- f. Operator. Personnel at Lancaster Engineering Company, Inc. operate the dam.
- g. Purpose of the Dam. The dam was originally built by the Clinton Company to provide water for the manufacturing of textiles. Since that time, the dam has been owned and operated by various companies to store water for industrial use. Currently, the water is being used by Injectronics and NYPRO, companies located downstream in a mill on Union Street. They use water from the 20-inch conduit for cooling machinery and for boiler feed water. Water from the 24-inch outlet conduit is not being used.
- h. Design and Construction History. The earth dam was built in 1846 with an earth channel near the southeast abutment leading to the mill downstream. A report dated 1972 on flood conditions in Counterpane Brook states that in March 1876, the flood of record occurred, resulting in a high water at El 335.1 in Mossy Pond and at El 332.7 in Coachlace Pond. The dam at Mossy Pond failed and was immediately rebuilt that year. In 1881, the Bigelow Carpet Company, owner of Coachlace Pond Dam, constructed gate house A, the outlet conduits, and the spillway (see Figure B-7). It is unknown when gate house B was built. Inspection records indicate that the

COACHLACE POND DAM

highway on the crest of the dam had been built by 1924. Flashboards were reportedly in use by 1938.

By 1964, gate house A had been boarded up and locked. In March of 1968, a second flood occurred, causing the pond to overflow the dike along the railroad tracks. Overflow of the channel below the spillway also caused damage to mill yards downstream. In 1968, the Worcester County Commissioners recommended that the dike be raised 2 feet or to the same elevation as the crest of the dam. A report prepared by Metcalf & Eddy, Inc. in 1972 recommended that an emergency spillway be built at the location of the dike and discharging into a proposed 72-inch outlet to Counterpane Brook. It was also recommended that improvements be made to upstream culverts and downstream channels. Most of these recommendations were not implemented, although some minor repair of culverts and channels was performed.

1. Normal Operating Procedure. Personnel from Lancaster Engineering Company, Inc. reportedly place about 1 foot of flashboards on the crest of the spillway in early summer and remove them in the fall. Gate controls for the conduits are normally not operated. The gates are kept open, except the one for the 24-inch bypass which is kept closed.

1.3 Pertinent Data

- a. Drainage Area. Coachlace Pond has a drainage area of approximately 2,880 acres (4.5 square miles, see Figure D-1). The land in the watershed is gently rolling, sparsely developed farmland. About half of the area is cleared and used largely for orchards. The remaining area is wooded.

The drainage area includes South Meadow and Mossy Ponds, located to the northwest and west of Coachlace Pond (see Location Map). These ponds are separated from Coachlace Pond by the embankment for the Boston and Maine Railroad tracks which are active and serve industries in Clinton. A double box culvert

COACHLACE POND DAM

constructed of granite blocks connects these upstream ponds to Coachlace Pond.

The culvert openings are 4.5 feet wide by 7 feet high with inverts at El 327.5. The embankment for South Meadow Street extends across South Meadow Pond. A 4-foot high by 4.5-foot wide box culvert with an invert at El 326.4 connects the two sections of the pond.

The submerged remnants of a cofferdam form a sill between Mossy Pond and South Meadow Pond (see Location Map). The cofferdam consists of two rows of timber sheeting spaced 8 feet apart. The sheeting is cut off at the bottom of the pond which is about El 326.5.

- b. Discharge at the Dam Site. Uncontrolled discharge at the dam is over the spillway which is 21.7 feet long and at El 329.5 and into the man-made channel of Counterpane Brook. The first reach of the channel is 57 feet long, 24 feet wide, and consists of a bedrock floor with vertical side walls about 13 feet high. At 57 to 135 feet downstream, a railroad track diagonally crosses the discharge channel about 2.5 feet above the stream bed. The water flow downstream in a 24-foot wide channel with the floor on bedrock and vertical side walls 3 to 8 feet high. The overall gradient of the discharge channel is 4.3 percent. At about 800 feet downstream of the spillway, the water enters a series of covered channels beneath industrial buildings and leads to a mill dam just north of Water Street (see Figures B-5 and B-6). From that point, the water continues north in the natural channel of Counterpane Brook for a distance of about 0.9 miles to the Nashua River.

Hydraulic analyses indicate that the spillway can discharge an estimated 380 cfs when the pond level is at El 333.0 which is the low area on the crest of the dike. An outflow test flood of 2,010 cfs will result in a water surface at El 336.0, which will overtop the dike by about 3 feet.

COACHLACE POND DAM

Controlled discharge is through two outlet conduits, 20 inches and 24 inches in diameter, which lead to mill buildings downstream (see Figure B-5). Flow through these conduits is controlled by two sets of gates, one in gate house A next to the spillway and one in gate house B downstream. There is also a 24-inch bypass which originates in gate house B and discharges to the channel below the spillway. All gates are reported to be normally open, except for the bypass which is closed.

c. Elevation (feet above Mean Sea Level (MSL)).
The benchmark at El 329.5 which is located on the crest of the spillway was taken from a report by Metcalf & Eddy, Inc. dated August 21, 1972.

- (1) Top dam: 339.6 to 343.3
Top dike: 333.0 to 334.8
- (2) Test flood pool: 336.0
- (3) Design surcharge (original design):
Unknown
- (4) Full flood control pool: Not Applicable
(N/A)
- (5) Recreation pool: 329.5
- (6) Spillway crest (ungated): 329.5
- (7) Upstream portal invert diversion tunnel:
N/A
- (8) Stream bed at centerline of dam: 326.4
(bottom of channel below spillway)
- (9) Maximum tailwater: 326.9 (stream surface
below spillway)

d. Reservoir

- (1) Length of maximum pool: 2,800 feet
- (2) Length of recreation pool: 2,800 feet
- (3) Length of flood control pool: N/A

COACHLACE POND DAM

e. Storage (acre-feet)

- (1) Test flood surcharge (Net):
241 at El 336.0
3-pond area: 871 at El 336.0
- (2) Top of dike: 186
3-pond area: 670
- (3) Flood control pool: N/A
- (4) Recreation pool: 56 (Approximate)
3-pond area: 201
- (5) Spillway crest: 56
3-pond area: 201

f. Reservoir Surface (acres)

- *(1) Top dike: 37
3-pond area: 134
- *(2) Test flood pool: 37
3-pond area: 134
- (3) Flood-control pool: N/A
- (4) Recreation pool: 37
3-pond area: 134
- (5) Spillway crest: 37
3-pond area: 134

g. Dam

- (1) Type: Earthfill
- (2) Length: 440 feet
- (3) Height: 13 feet
- (4) Top width: Varies 34 to 185 feet (where
southeast abutment includes New Harbor
Road and Franklin Street)

*Based on the assumption that the surface area will not significantly increase with changes in pond elevation from 329.5 to 333.0

COACHLACE POND DAM

- (5) Side slopes: Upstream - 2.0:1 to 2.7:1
Downstream - 1.5:1 to 2.0:1
- (6) Zoning: Unknown
- (7) Impervious core: Unknown
- (8) Cutoff: Unknown
- (9) Grout curtain: Unknown

i. Spillway

- (1) Type: broad crest
- (2) Length of weir: 21.7 feet (net)
- (3) Crest elevation: 329.5 MSL (assumed benchmark)
- (4) Gates: None
- (5) Upstream channel: 24-foot wide, 100-foot long approach channel with vertical stone side walls, trash rack at upstream end
- (6) Downstream channel: 24-foot wide channel with vertical concrete sidewalls with floor on bedrock.
- (7) General: Brick service house over spillway with opening in floor and remnants of hoist for installing and removing flashboards. Weir has 4 bays separated by I-beams to hold flashboards.

- j. Regulating Outlets. There are two outlet conduits, 20 inches and 24 inches in diameter, which lead to mills downstream. Flow through these outlets is controlled by two sets of gates, one in gate house A next to the spillway, and one in gate house B 200 feet downstream. The invert of the inlet into the upstream gate house is at El 323.8. There is also a 24-inch bypass conduit which originates in gate house B and discharges to the channel below the spillway. This bypass has been used in the past to draw down the pond level during periods of heavy runoff. The invert at the downstream end of the bypass is at El 307.5

COACHLACE POND DAM

SECTION 2

ENGINEERING DATA

- 2.1 General. There is a drawing dated August 9, 1881 by Phinehas Ball that shows proposed construction of the spillway and outlet works at Coachlace Pond Dam (see Figure B-7). The existing conduits are not the same size as shown, and the drawing differs in other ways from the actual construction. There are no other plans, specifications, or computations available from the Owner, State, or County offices relative to the design and construction of this dam.

A report dated August 21, 1972 was prepared by Metcalf & Eddy, Inc. entitled "Improving Flood Conditions in Counterpane Brook in the Town of Clinton". The report describes the channels and culverts along Counterpane Brook and the occurrence of past floods. Some data is cited in this report, and a plan and profile is included in Appendix B (see Figures B-5 and B-6).

The only other data available for this evaluation were visual observations made during inspection, a review of previous inspection reports, and conversations with the Owner and with personnel from companies located along the outlet conduits downstream of the dam.

We acknowledge the assistance and cooperation of personnel of the Massachusetts Department of Public Works, Messrs. Willis Regan and Raymond Rochford, and of the Massachusetts Department of Environmental Quality Engineering, Division of Waterways, Messrs. John J. Hannon and Joseph Iagallo.

Also, we acknowledge the cooperation and assistance of the Worcester County Engineer's Office: Messrs. John O'Toole and Joseph Brazauskas.

In addition, we thank Mr. John J. Gannon, Jr., who allowed us to inspect the dam and provided information on its operation. Messrs. Carol Struntz of Injectronics and Peter Easley of NYPRO also provided information on the downstream use of the outlet conduits.

COACHLACE POND DAM

- 2.2 Construction Record. The only construction record is the 1881 drawing on proposed construction of the spillway and outlet works. There are no as-built drawings for the dam.
- 2.3 Operating Records. No operating records are available, and there is no daily record kept of the pool elevation or rainfall at the dam site.
- 2.4 Evaluation
- a. Availability. There is limited engineering data available due to the age of the dam.
 - b. Adequacy. The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and engineering judgment.
 - c. Validity. Comparison of the 1881 drawing with information determined during the Phase I inspection indicates that some measurements shown vary from those actually constructed. Also, details of the interior of the gate house could not be verified during the inspection. The 1881 drawing is therefore regarded as generalized and may not be valid in detail.

SECTION 3
VISUAL INSPECTION

3.1 Findings

- a. General. The Phase I inspection of the dam at Coachlace Pond was performed on September 7, 1978. A copy of the inspection checklist is given in Appendix A. Previous inspections by others have been made since 1924. A partial listing of these inspections is included in Appendix B. An inspection was made on November 13, 1973 by the Massachusetts Department of Public Works. A copy of their report is given in Appendix B.
- b. Dam. Coachlace Pond dam is an earthfill dam with two merging roads on the crest and a stone wall along part of the top of the upstream slope. The earth embankment is generally in fair condition. The crest of the dam is mostly covered with asphalt pavement which is in good condition. Along the upstream edge of the crest, there is a wall 1.5 feet high made of cut granite blocks and extends from near the gate house to near the intersection of Old Harbor Road and Franklin Street. The wall does not appear to be a structural element of the dam, and may have been built to support the pipe railing which is on top. The wall is tilted in the upstream direction, and the pipe railing is collapsing in places. The earth slope along the bottom of the wall down to the water surface is covered with loose riprap. This slope is thickly overgrown with brush and trees 6 to 12 inches in diameter. From the southeast end of the stone wall to the southeast abutment, the upstream face of the dam is a sandy slope which is not covered or riprapped. Wave action from the pond and surface runoff from New Harbor Road have eroded this portion of the upstream face of the dam. Localized erosion from surface runoff has also occurred on the upstream slope at a low spot near the midpoint of the dam and at the approach channel to the gate house. The downstream face of the dam is in good condition. No seepage was observed and the slope

COACHLACE POND DAM

is fairly clear of trees and brush. There is a chain link fence along the toe, however, which collects soil, leaves, and other debris and obscures inspection of the lower portion of the slope.

- c. Appurtenant Structures. The approach channel to the spillway is 100 feet long and has vertical, mortar-faced, stone masonry side walls. The mortar facing is severely cracked and eroded, exposing the underlying stonework. Brush and several trees are growing in the floor of the channel. A trash rack across the upstream end of the channel is not securely supported and is starting to collapse. Some wood and trash is scattered on the floor of the channel, and two manholes form obstructions near the upstream end. The spillway is an asphalt-covered stone masonry weir with three vertical I-beams to support flashboards and a brick arch overhead. The arch supports a brick service building and concrete deck over the spillway. Seepage was observed flowing from stonework on the downstream face of the weir and from the sidewalls downstream of the weir. Some seepage also appears to be flowing from other areas in the stonework on the downstream face of the weir. This leakage was noted previously in an inspection report dated September 22, 1964. Some erosion of the rubble foundation of the side walls next to the weir has also occurred. The asphalt covering on the crest of the spillway has pulled away from the side walls. Scattered wood debris is also on the crest of the spillway. The service building overhead has been severely vandalized and large portions of the walls are missing. The concrete deck is also eroded and crumbling in places. The channel below the spillway consists of a reach about 60 feet long with vertical side walls, then a diagonal opening where a railroad spur crosses the channel. Below that there is an open channel with vertical side walls. In the first reach, the mortar facing of the side walls is severely cracked and eroded. The capstones of the walls are loose and a few have fallen into the channel. There is brush growing in the floor of the channel, and wood and trash are also scattered over the floor.

COACHLACE POND DAM

A sewer manhole is located in the middle of the channel about 75 feet downstream of the spillway. Where the railroad spur crosses the channel, there are no side walls to the downstream channel. At this point, water flows through a narrow opening between concrete support walls beneath the railroad spur. Two 20-inch diameter cast-iron drain pipes are also located beneath the track, but these are clogged with debris at the upstream end. The railroad track appears to be in fair condition, but is not used and is an obstruction to flow. The channel below the railroad has a thick growth of trees and brush along the tops of the side walls, and some brush growing in the floor. Wood and other debris is also scattered on the floor.

The outlet works at the dam include an upstream and a downstream gate house and two outlet conduits. The upstream gate house is a brick building with an approach channel from the pond. The brick work on the gate house is in good condition, but the roof is starting to collapse. Access to the gate house has been blocked, therefore, an inspection of the gates and outlet conduits could not be made. The mortar facing on the side walls of the approach channel is severely cracked and eroded. The downstream gate house is a small brick building containing 5 gate valves. The only access to the building is through a hole in the wall. There is 1 to 2 feet of standing water in the bottom of the building, and the wood floor has completely collapsed. The gate stems, however, are above water, but do not have any operating mechanism attached.

The dike along the railroad tracks is in good condition. The crest and slopes are somewhat irregular. There is a footpath along the narrow crest and grass and brush on the slopes. Riprap has been placed on the slope facing the pond. No seepage or significant erosion was observed.

The dam at Mossy Pond is in fair condition. A footpath and chain link fence are on the crest, and the lower portion of the upstream

COACHLACE POND DAM

face is covered with riprap. Several foot-paths on the upstream face have formed gullies of erosion. Near the northwest abutment, one of the gullies extends to the edge of the crest and has undercut a section of the chain link fence. A dense growth of brush and trees 3 to 18 inches in diameter is growing on the upstream slope, and a few trees are on the downstream slope. No seepage was observed.

- d. Reservoir Area. The area around Coachlace Pond is practically undeveloped. The embankment of the Boston and Maine Railroad occupies the entire northwest shoreline of the pond. However, future development could occur along the southeast shore. The area is generally cleared land with moderate slopes of about 10 percent.
- e. Downstream Channel. Discharge from the dam flows downstream in a recessed open channel 24 feet wide with vertical side walls 3 to 8 feet high. The channel has a downstream gradient of 4.3 percent. At about 800 feet downstream of the dam, flow enters a series of covered channels which lead to a mill dam near Water Street. From that point, flow continues north in the natural channel of Counterpane Brook for about a mile and joins the Nashua River.

- 3.2 Evaluation. The above findings indicate that the dam has several signs of distress which require attention. It is evident that the dam is not adequately maintained and that deterioration will continue unless action is taken. Recommended measures to improve these conditions are included in Section 7.

SECTION 4

OPERATING PROCEDURES

- 4.1 Procedures. The normal operating procedure is to place about 1 foot of flashboards on the crest of the spillway in early summer and remove them each fall. This is usually done to maintain a water supply to the downstream mill, however, it was not necessary this year. The gates at the upstream end of the outlet conduits are not operated, and access to the gate house is blocked off. The valves in the downstream gate house are kept open to allow flow through the outlet conduits. The valve which controls the 24-inch by-pass is kept closed, but is reportedly opened periodically when heavy run-off occurs. The last time that valve was opened was 5 or 6 years ago.

There are several shut-off valves in the mill on Union Street to control flow from the 20-inch conduit. However, these gates are kept open and have not been operated for many years. In the mill on Main Street, water from the 24-inch conduit has not been used for at least 40 years. The locatin of the control valve is unknown or whether it is still operable.

- 4.2 Maintenance of Dam. There is no regular program of maintenance at this dam. A chain link fence for security was recently installed along the inlet to gate house A. However, the service house over the spillway is severely vanadalized and the roof on gate house A is starting to collapse. The concrete facing on the walls of the spillway channel is severely eroded and the capstones are falling off. Trees and brush are growing in the channel of the spillway and on the upstream face and downstream toe of the dam. Localized erosion has also taken place on the upstream face of the dam.
- 4.3 Maintenance of Operating Facilities. Gate house A is inaccessible, and the condition of the gates is unknown. Gate house B is accessible through a hole in the brick wall on the north side of the building. The wooden floor of the house has completely collapsed, and there are about 2 feet of water in the bottom of the structure. The gate

COACHLACE POND DAM

valves have gears which are above water, but are missing a mechanism to operate them. The gates have not been operated for at least 5 years.

The shut-off valves in the mills downstream have not been used in many years. The valves are very old, and their condition is unknown.

- 4.4 Condition of Any Warning Systems in Effect. There are no warning systems in effect at this dam.
- 4.5 Evaluation. The operational and maintenance systems at this dam are inadequate, and there is no warning system in effect. This is an unsatisfactory situation considering that the dam is in the "significant" hazard category. A program of operation and maintenance for this dam should be implemented as recommended in Section 7.

SECTION 5

HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. Design Data. The Probable Maximum Flood (PMF) rate was determined to be 1,450 cfs per square mile. This calculation is based on the average drainage area slope of 2.5 percent, the pond-plus-swamp area to drainage area ratio of 7.7 percent, and the U.S. Army Corps of Engineers' guide curves for Maximum Probable Flood Peak Flow Rates (dated December 1977). Applying one-half the PMF to the 4.5 square miles of drainage area results in a calculated peak flood flow of 3,270 cfs as the inflow test flood. By adjusting the inflow test flood for surcharge storage, the maximum discharge rate was established as 2,010 cfs (446 cfs per square mile), with a water surface at El 336.0

Flow over the crest of the dike along the railroad is predicted to be 1,030 cfs. Flow through the spillway (assuming flashboards have been removed) would be 980 cfs. The maximum head on the dike would be 3.0 feet with a discharge of 1.1 cfs per foot of width. Depth at critical flow would be at 1.8 feet with a velocity of 7.4 feet per second.

Hydraulic analyses indicate that the existing spillway can discharge flows of 380 cfs at water surface El 333.0 which is the low area on the crest of the dike.

A 1972 report on flood conditions in Counterpane Brook indicates that two pipelines can be operated at the Coachlace Pond outlet works. A 20-inch line serves the former Bigelow Carpet Company. A 24-inch line serves another mill. The 24-inch line contains a reportedly operable bypass to Counterpane Brook. The bypass has, at pond El 329.5, a nominal capacity of 43 cfs (9.5 csm) according to the report. Operation of the outlet would allow a 1 foot drawdown of Coachlace Pond in 10.4 hours. The whole group of ponds would lower a foot in about 37 hours.

COACHLACE POND DAM

- b. Experience Data. Hydraulic records are available from a report on flood conditions in Counterpane Brook dated August 21, 1972. The flood of record occurred in March 1876, causing failure of the dam on Mossy Pond. The second highest flood occurred in March 1968, causing overtopping of the dike at Coachlace Pond Dam. Pond elevations for these events are given below:

	<u>March 1876</u>	<u>March 1968</u>
South Meadow Pond (west)	334.93	333.95
Mossy Pond	335.13	-
Coachlace Pond	332.68	333.10

Damages incurred during the 1968 event were due primarily to backing up and overflowing of channels downstream of the dam. The report does not mention the loss of any lives.

c. Visual Observations

Discharge from Coachlace Pond is over an ungated, broad crest spillway and into Counterpane Brook. The approach channel to the spillway is about 100 feet long and 24 feet wide. The floor is nearly flat and made of soil; the walls are vertical and made of dry stone faced with mortar. A trash rack is located across the upstream end of the approach channel. There are obstructions in the channel, including trees, brush, debris, and two manholes protruding from the floor. The crest of the spillway contains three I-beams forming four bays for flashboards. The crest of the spillway is at El 329.5 and has a clear length of 21.7 feet. The downstream channel is in three sections. The upper section is about 60 feet long with vertical side walls about 13 feet high and a floor on bedrock. A railroad spur crosses the channel at 60 feet downstream, forming a break in the side walls which would permit overflowing during flood periods. A manhole is located in the floor of the channel just upstream of the railroad spur. The last section of the channel is 24 feet wide with vertical, dry stone side walls 3 to 8 feet high.

COACHLACE POND DAM

The outlet works at the dam consist of gate house A near the spillway and gate house B along the discharge channel below the railroad spur. Two outlet conduits, 20 and 24 inches in diameter lead from gate house A to gate house B, then turn and lead to mills downstream. A bypass from the 24-inch conduit leads from gate house B into the discharge channel of the spillway.

- d. Overtopping Potential. The outflow test flood of 2,010 cfs will overtop the dike by a maximum of 3.0 feet, but will not overtop the dam. In the event of overtopping, complete failure of the dike could occur, but would not produce a significant increase in the level of flood water already discharging along the railroad tracks. The flow would be carried along the railroad embankment toward downtown Clinton. Failure of the main dam during a test flood is unlikely due to lack of overtopping and especially due to high ground levels at the downstream toe.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. The evaluation of the structural stability of Coachlace Pond Dam is based on the visual inspection conducted on September 7, 1978. As discussed in Section 3, Visual Inspection, the embankment is in fair condition. Erosion has occurred in several areas along the upstream face of the dam, especially near the southeast abutment where riprap is missing. A dense growth of trees and brush has also occurred along most of the upstream slope. Soil, leaves, and other debris has accumulated at the downstream toe of the dam where there is a chain link fence.
- b. Design and Construction Data. Discussions with the Owner, County and State personnel indicate that there are no plans, specifications or computations relative to the design or construction of the embankment. Furthermore, information on the type, shear strength, and permeability of the soil and/or rock materials of the dam embankment apparently does not exist.
- c. Operating Records. There is no evidence that instrumentation of any type was ever installed at Coachlace Pond Dam. The performance of this dam under prior loading can only be inferred from previous records and physical evidence at the site.
- d. Post-Construction Changes. The original dam at Coachlace Pond was constructed in 1846. The only apparent post-construction changes were construction of the spillway and outlet structures in 1881 and the addition of New Harbor Road and Franklin Street on the crest of the dam some time between 1881 and 1924.
- e. Seismic Stability. The dam is located in Seismic Zone No. 2 and in accordance with Phase I "Recommended Guidelines" does not warrant seismic analyses.

COACHLACE POND DAM

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition. Built in 1846, Coachlace Pond Dam was neither designed nor constructed according to current approved state-of-the-art procedures. Based upon the visual inspection of the site, a review of limited engineering data, and the lack of operating or maintenance information, there are deficiencies which must be corrected to assure the continued performance of this dam.

The overall condition of the dam is considered to be fair, although the spillway and outlet structures are in poor condition. The brick in the service house over the spillway has been severely damaged. The building could be a serious hazard if it collapses and blocks the spillway channel. The railroad spur across the downstream channel is an obstruction to flow and produces gaps in the side walls of the downstream channel. Water is seeping from the stone foundation of the spillway along the downstream face and at both side walls. The mortar facing of the side walls is severely eroded, and the capstones are falling into the channel. Several obstructions are located in the floor of the spillway channel, including three manholes and a growth of trees and brush. The trash rack upstream of the spillway is not securely mounted and could also become an obstruction if washed downstream.

The condition of the outlet structures, although generally unknown, is considered poor. Gate house A has been blocked off at least since 1964. The condition of the gates and upstream openings of the outlet conduits is unknown. The mortar facing on the side walls of the approach channel is severely cracked and eroded. The condition of the outlet conduits is unknown.

COACHLACE POND DAM

Gate house B downstream of the dam is only accessible through a hole in the wall. The condition of the gates is unknown, except that 1 to 2 feet of water is in the bottom of the building. The wooden floor of the building is completely collapsed, and there is no operating mechanism on the gate stems.

The earth embankment of the dam is in fair condition. Erosion has occurred on the upstream slope, especially along the unprotected portion southeast of the stone wall, and locally near the midpoint of the dam and at the approach channel to the gate house. A very dense growth of trees and brush has also occurred on the upstream face below the stone wall. Soil, leaves, and trash have accumulated along a chain link fence at the downstream toe of the embankment.

The dike along the railroad tracks is a minor structure which is in good condition. No seepage or significant erosion was observed.

Hydraulic analyses indicate that the spillway can discharge an estimated 380 cfs when the pond level is at El 333.0 which is the low point on the crest of the dike. An outflow test flood of 2,010 cfs will overtop the dike by a maximum of 3.0 feet, but will not overtop the main dam. The spillway can only discharge 19 percent of the test flood before overtopping the dike.

- b. Adequacy of Information. The lack of in-depth engineering data did not allow for a definitive review. Therefore the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on visual inspection, past performance history and engineering judgment.
- c. Urgency. The recommendations and remedial measures outlined below should be implemented by the Owner within two years after receipt of this Phase I Inspection Report.
- d. Need for Additional Investigation. Additional investigations to further assess the

COACHLACE POND DAM

adequacy of the dam and appurtenant structures are outlined below in Section 7.2, Recommendations.

7.2 Recommendations. In view of the concerns on the continued performance of this dam, it is recommended that the Owner employ a qualified consultant to:

- a. conduct a more detailed hydrologic and hydraulic analysis and review existing hydraulic data in the 1972 report to evaluate the following: raising the dike along the railroad, adding an emergency spillway, and/or removing the railroad spur and extending the side walls of the downstream channel
- b. investigate in detail the condition of all outlet works structures, provide recommendations on repair of gates and other facilities, and design an adequate regulating outlet for the dam

The recommendations on repairs and maintenance procedures are stated below under Section 7.3, Remedial Measures.

7.3 Remedial Measures

- a. Operating and Maintenance Procedures. The dam and appurtenant structures are not adequately maintained. It is recommended that the Owner accomplish the following:
 - (1) remove the deteriorating service building over the spillway, including the walkway
 - (2) remove the I-beams from the crest of the spillway
 - (3) grout stonework beneath the crest of the spillway and at the side walls where leakage is occurring and resurface with mortar; also repair the asphalt surface on the crest of spillway
 - (4) resurface the side walls of the spillway channel and approach channel to gate house A

COACHLACE POND DAM

- (5) repair the trash rack upstream of the spillway
- (6) backfill eroded areas on the upstream face of the dam and protect those areas with riprap
- (7) clear trees and brush from the floor of spillway channel and from the upstream face of dam
- (8) annually clean debris from along the chain link fence at the downstream toe of the dam
- (9) institute a definite plan for surveillance and warning system during periods of unusually heavy rains and/or runoff
- (10) implement a systematic program of maintenance inspections. As a minimum, the inspection program should consist of a monthly inspection of the dam and appurtenances, supplemented by additional inspections during and after severe storms. All repairs and maintenance should be undertaken in accordance with all applicable State regulations.
- (11) technical inspections of this dam should be conducted on an annual basis

7.4 Alternatives. An alternative to the recommendations in Section 7.2 and the maintenance procedures itemized below would be draining the pond and breaching or removing the dam.

COACHLACE POND DAM

APPENDIX A
PERIODIC INSPECTION
CHECKLIST

COACHLACE POND DAM

PERIODIC INSPECTION

PARTY ORGANIZATION

PROJECT Coachlace Pond Dam

DATE Sept 7, 1978

TIME 8:00 AM - 5:00 PM

WEATHER Sunny, warm

W.S. ELEV. 329.5 U.S. 326.9 D.N.S.

*based on assumed benchmark
El 329.5 on crest of spillway

PARTY:

- | | |
|---------------------------|-------------------------|
| 1. <u>Richard Sherman</u> | 6. <u>Frank Sviokla</u> |
| 2. <u>Lyle Branagan</u> | 7. _____ |
| 3. <u>Carol Sweet</u> | 8. _____ |
| 4. <u>Warren Diesl</u> | 9. _____ |
| 5. <u>Dave Cole</u> | 10. _____ |

PROJECT FEATURE

INSPECTED BY

REMARKS

- | | | |
|---------------------------------|---------------------------|--|
| 1. <u>dam embankment + dike</u> | <u>Sherman / Sweet</u> | |
| 2. <u>spillway</u> | <u>Branagan / Sherman</u> | |
| 3. <u>outlet works</u> | <u>Branagan / Sherman</u> | |
| 4. <u>Mossy Pond Dam</u> | <u>Sherman / Sweet</u> | |
| 5. _____ | _____ | |
| 6. _____ | _____ | |
| 7. _____ | _____ | |
| 8. _____ | _____ | |
| 9. _____ | _____ | |
| 10. _____ | _____ | |

Abbreviations: US = upstream

DS = downstream

PERIODIC INSPECTION CHECK LIST

PROJECT Coachlace Pond Dam

DATE Sept. 7, 1978

PROJECT FEATURE dam embankment

NAME Richard Sherman

DISCIPLINE geotechnical

NAME Carel Sweet

AREA EVALUATED	CONDITIONS
<u>EMBANKMENT</u>	
crest Elevation	<i>varies from 339.6 to 343.3</i>
present Pool Elevation	<i>329.5</i>
Maximum Impoundment to Date	<i>333.1- March 1968 pond elevation</i>
Surface Cracks	<i>none visible</i>
Pavement Condition	<i>asphalt pavement on crest - minor cracking</i>
Movement or Settlement of Crest	<i>original crest raised for roadways - no apparent movement or settlement</i>
Lateral Movement	<i>stone wall on US edge of crest tilted - probably due to loads from road</i>
Vertical Alignment	<i>curved, abutments higher</i>
Horizontal Alignment	<i>curved, convex upstream</i>
Condition at Abutment and at Concrete Structures	<i>NW abutment is earth + concrete retaining wall between spillway + railroad - SE abutment ties into natural hillside</i>
Indications of Movement of Structural Items on Slopes	<i>tilting of stone wall on US slope</i>
Trespassing on Slopes	<i>footpaths near gate house A, spillway, + downstream channel; beach near SE end dam</i>
Sloughing or Erosion of Slopes or Abutments *	<i>wave erosion of SE end, US face of dam; runoff erosion near midpoint, US face of dam; sloughing + erosion at approach wall to gate house A</i>
Rock Slope Protection - Riprap Failures	<i>riprap below stone wall + from approach channel to gate house A to approach channel to spillway - no rip rap at SE end of dam</i>
Unusual Movement or Cracking at or near Toes	<i>none visible - chain link fence at toe</i>
Unusual Embankment or Downstream Seepage	<i>none visible</i>
Piping or Boils	<i>none visible</i>
Foundation Drainage Features	<i>none known</i>
Toe Drains	<i>none known</i>
Instrumentation System	<i>none visible</i>

* thick growth of trees + brush on US slope of dam

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PERIODIC INSPECTION CHECK LIST

PROJECT Coachlace Pond Dam

DATE Sept. 2, 1978

PROJECT FEATURE earth dike

NAME Richard Sherman

DISCIPLINE geotechnical

NAME Carol Sweet

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	1.5 foot high dike along RR tracks
Crest Elevation	varies from 333.0 to 334.8
Current Pool Elevation	329.5
Maximum Impoundment to Date	333.1 - March 1968 pond elevation
Surface Cracks	none visible
Pavement Condition	not applicable
Movement or Settlement of Crest	none apparent - crest irregular
Lateral Movement	none apparent
Vertical Alignment	fairly flat
Horizontal Alignment	straight
Condition at Abutment and at Concrete Structures	good - abutments tie into natural ground
Indications of Movement of Structural Items on Slopes	not applicable
Trespassing on Slopes	none apparent
Sloughing or Erosion of Slopes or Abutments	not significant - some brush growth
Rock Slope Protection - Riprap Failures	loose riprap on US face
Unusual Movement or Cracking at or near Toes	none visible
Unusual Embankment or Downstream Seepage	none visible
Piping or Boils	none visible
Foundation Drainage Features	unknown
Toe Drains	unknown
Instrumentation System	none visible

PERIODIC INSPECTION CHECK LIST

PROJECT Cochlase Pond Dam

DATE Sept. 7, 1978

PROJECT FEATURE dam at Mossy Pond

NAME Richard Sherman

DISCIPLINE geotechnical

NAME Carol Sweet

AREA EVALUATED	CONDITION
DAM DIKE EMBANKMENT - MOSSY POND DAM	-no spillway or outlet structures
Crest Elevation	varies from 343.0 to 344.6
Current Pool Elevation	329.5
Maximum Impoundment to Date	335.1 - March 1876 pond elevation
Surface Cracks	none visible
Pavement Condition	not applicable
Movement or Settlement of Crest	none visible
Lateral Movement	none visible
Vertical Alignment	relatively flat
Horizontal Alignment	relatively straight
Condition at Abutment and at Concrete Structures	abutments tie into natural hillsides - good condition
Indications of Movement of Structural Items on Slopes	not applicable
Trespassing on Slopes	footpaths on US + DS slopes
Sloughing or Erosion of Slopes or Abutments *	erosion along footpaths from surface runoff (1' to 2' deep in places) - trees 3" to 18" in diameter + brush on US + DS slopes
Rock Slope Protection - Riprap Failures	riprap on lower 1/3 of US slope
Unusual Movement or Cracking at or near Toes	none visible
Unusual Embankment or Downstream Seepage	none visible
Piping or Boils	none visible
Foundation Drainage Features	unknown
Toe Drains	unknown
Instrumentation System	none visible

* fence at US edge of crest undercut + collapsed for 80 feet at north end of dam

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PERIODIC INSPECTION CHECK LIST

PROJECT Coachlance Pond Dam

DATE Sept. 7, 1978

PROJECT FEATURE gate house A

NAME Lyle Brianagan

DISCIPLINE geotechnical

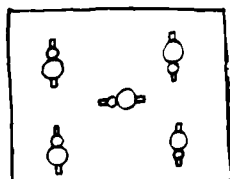
NAME Richard Sherman

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND ** INTAKE STRUCTURE	
a. Approach Channel	38' long, 20'-22' wide channel with vertical side walls
Slope Conditions	mortar facing on side walls severely cracked + eroded
Bottom Conditions	not visible - standing water 5.7' deep
Rock Slides or Falls	not applicable
Log Boom	metal frame with 2 bays at US extl- screen in 1 bay
Debris	minor
Condition of Concrete Lining	mortar facing on walls cracked + eroded
Drains or Weep Holes	none visible
b. Intake Structure *	gate house not accessible - opening from channel 2.6' wide x 16.2' high
Condition of Concrete	opening in granite block foundation of gate house - good condition
Stop Logs and Slots	slots present, no gate - screen on opening

* US end of outlet conduits + gate controls inside building +
not accessible for inspection

** gate house B downstream of dam - hole in wall for access,
1'-2' standing water in bottom - wooden floor collapsed

5 gates present - gears at top above water - no operating
mechanisms



Sketch of Gates in
Gate House B

discharge
channel

PERIODIC INSPECTION CHECK LIST

PROJECT Coachlance Pond Dam DATE Sept. 7, 1978
 PROJECT FEATURE spillway NAME Richard Sherman
 DISCIPLINE geotechnical NAME Lyle Branagan

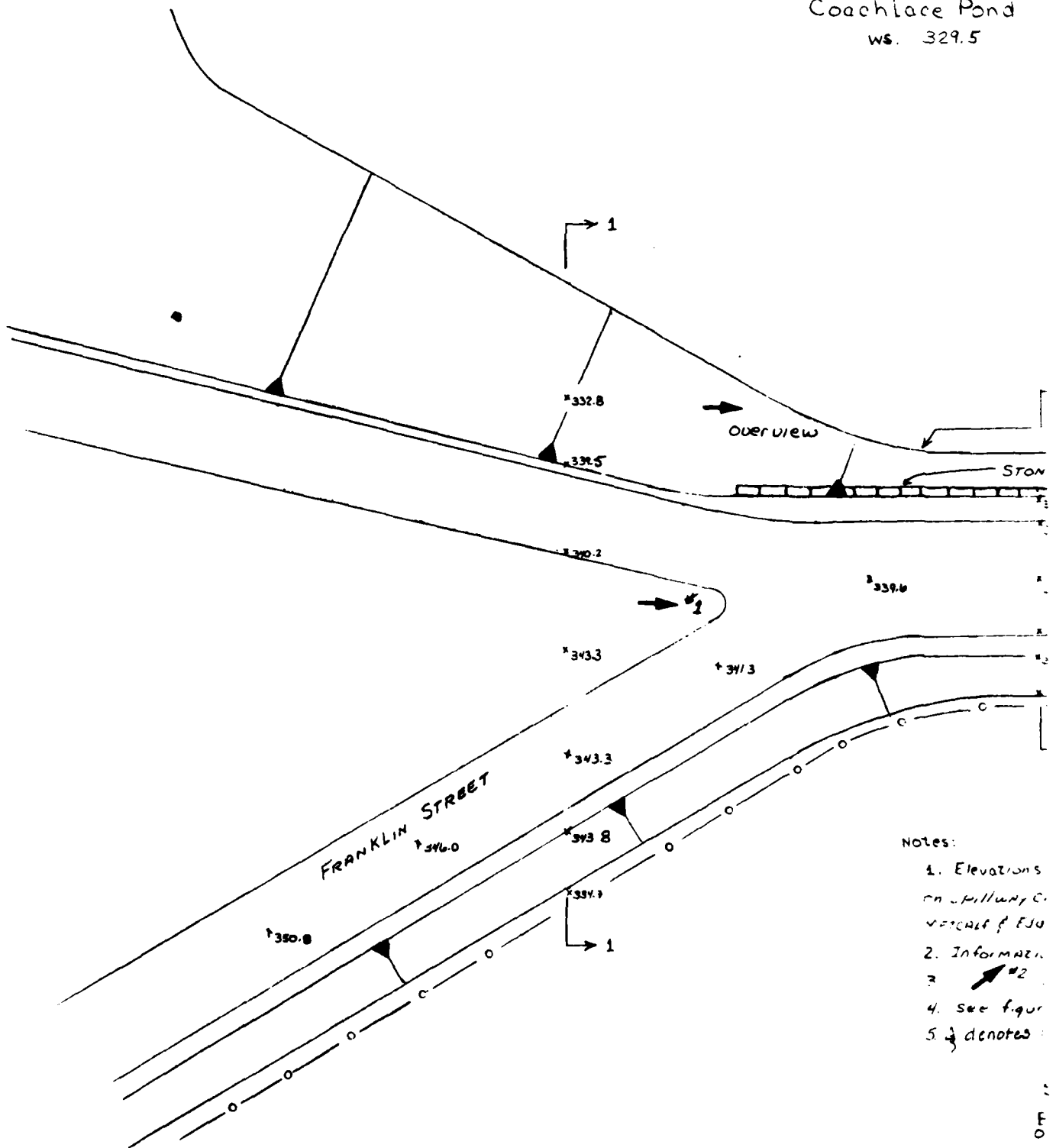
AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	100' long, 24' wide approach channel - vertical side walls of dry stone masonry trash rack across US end of channel
a. Approach Channel	
General Condition	poor - severe cracking + erosion of walls trash rack falling over - debris in channel
Loose Rock Overhanging Channel	loose capstones on top of side walls
Trees Overhanging Channel	6"-12" trees + brush overhanging channel
Floor of Approach Channel	2 manholes at 70' US of spillway - 12"-15" trees in floor + brush growing - scattered debris
b. Weir and Training Walls *	weir has 4 bays separated by 3 I-beams wooden boards propped open in SE bay
General Condition of concrete Asphalt surface	fair - pulling away from sides
Rust or Staining	not applicable
Spalling	erosion of mortar facing at base of both side walls at DS edge of weir
Any Visible Reinforcing	not applicable
Any Seepage or Efflorescence	seepage from DS face of weir, esp. at both sides + from both side walls immediately DS of weir
Drain Holes	none visible
c. Discharge Channel	24' wide channel w/ vertical side walls bedrock in floor + sides
General Condition	poor - walls eroded, capstones falling into channel - debris + brush in floor
Loose Rock Overhanging Channel	loose capstones on side walls
Trees Overhanging Channel	none
Floor of Channel	brush + small trees growing - debris (trash + wood)
Other Obstructions	manhole in floor ± 75' DS of spillway RR spur crosses ± 60' DS of spillway discharge pipes (3), 2 at 20" + 1 at 12" beneath RR spur

* brick service building over
spillway - walls vandalized,
concrete floor spalled, grating
over access slots missing sections,
hoisting apparatus gone - condition
generally very poor

APPENDIX B

	<u>Page</u>
Figure B-1, Plan of dam	B-1
Figure B-2, Sections of Dam	B-2
Figure B-3, Plan of Dike and Section	B-3
Figure B-4, Mossy Pond Dam	B-4
Figure B-5, Drainage Area of Counterpane Brook, from report by Metcalf & Eddy, Inc. dated August 1972	B-5
Figure B-6, Profile Along Counterpane Brook, from report by Metcalf & Eddy, Inc. dated August 1972	B-6
Figure B-7, Plan of Proposed Outlet Works, dated August 9, 1881	B-7
Previous Inspections (Partial Listing)	B-8
Inspection Report by Massachusetts Department of Public Works, November 1973	B-10

Coachlance Pond
ws. 329.5



NOTES:

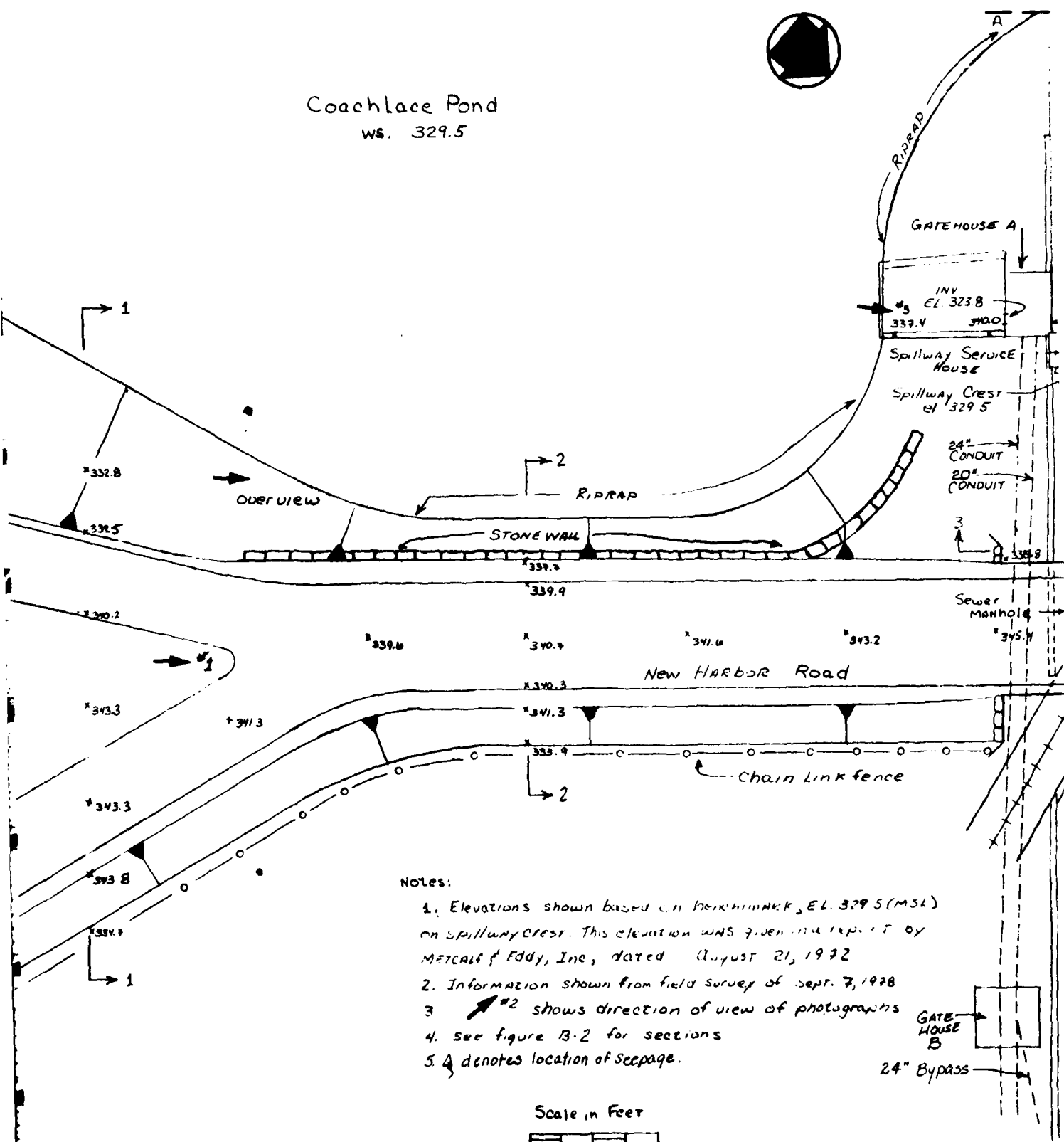
1. Elevations on Hillway C. V. 100 ft. E.D.
2. Information
3. See figure
5. denotes

F
O

Q

Coachlace Pond
WS. 329.5

Trash rack --

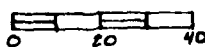


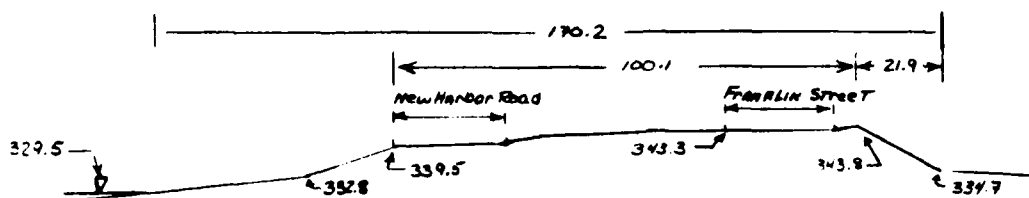
NOTES:

1. Elevations shown based on benchmark, EL. 329.5 (MSL) on spillway crest. This elevation was given in a report by METCALF & Eddy, Inc., dated August 21, 1972
2. Information shown from field survey of Sept. 7, 1978
3. #2 shows direction of view of photographs
4. See figure B-2 for sections
5. 4 denotes location of seepage.

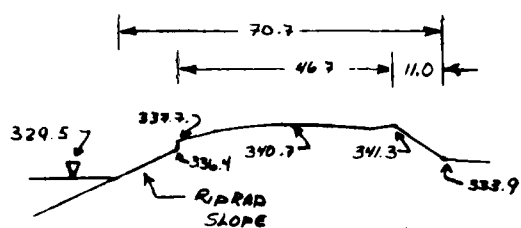
GATEHOUSE B
24" Bypass

Scale, in Feet



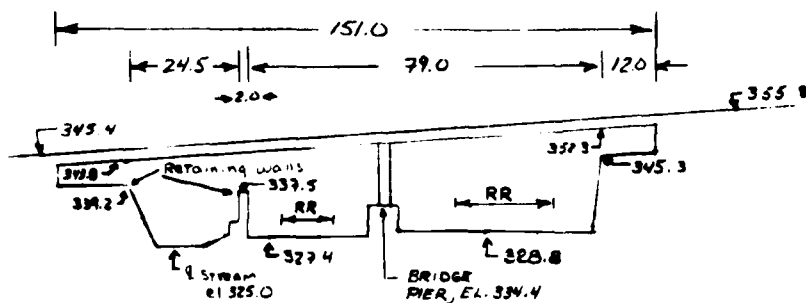


Section 1-1

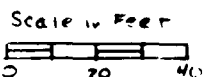


Section 2-2

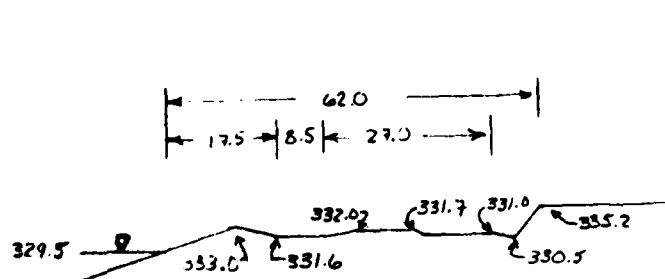
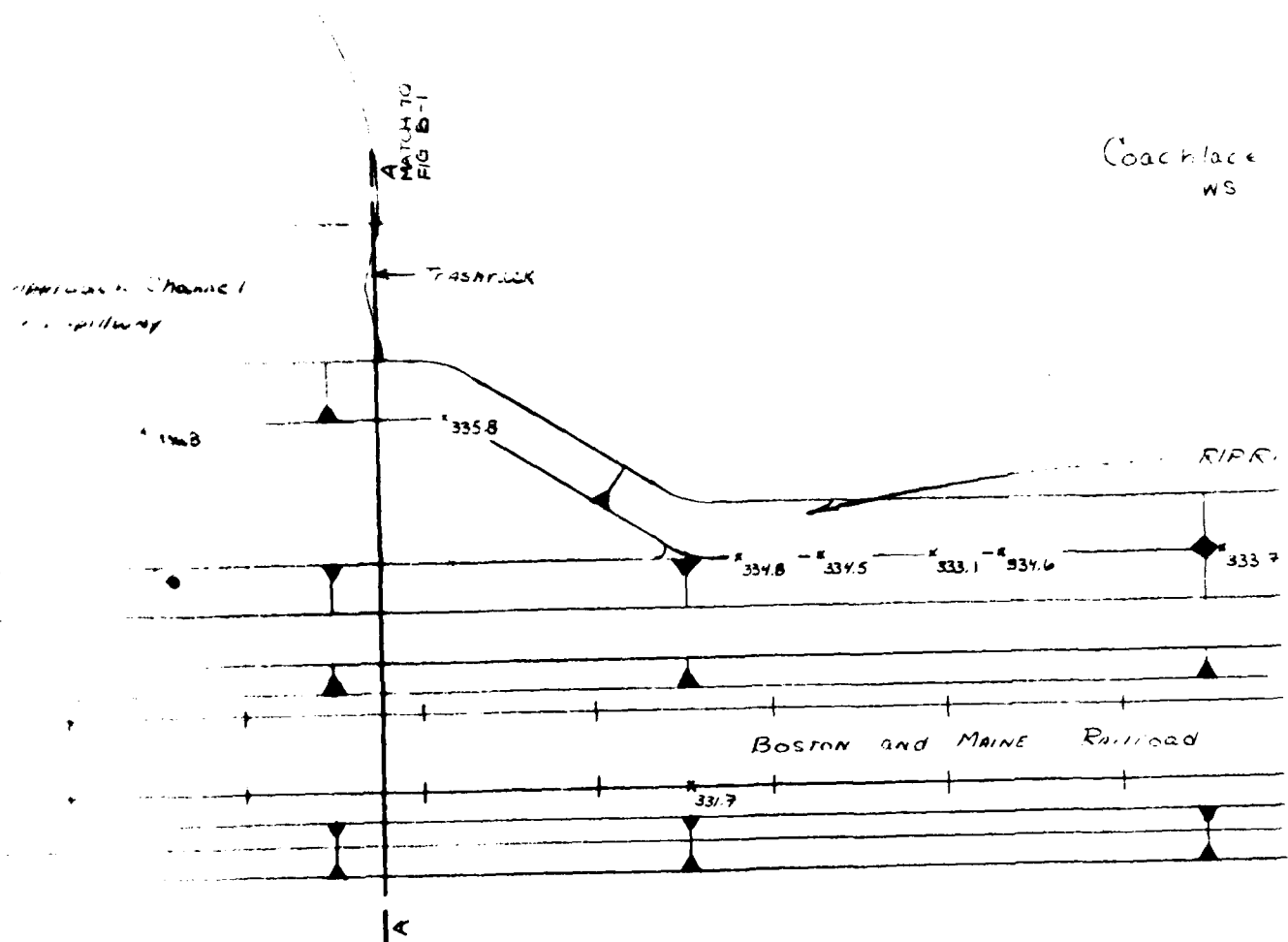
NOTES:
 1) Elevations shown based on benchmark, el. 329.5 (msl), on spillway crest. (see Fig. 3-1)
 2) Information shown based on field survey of Sept. 7, 1978.



Section 3-3

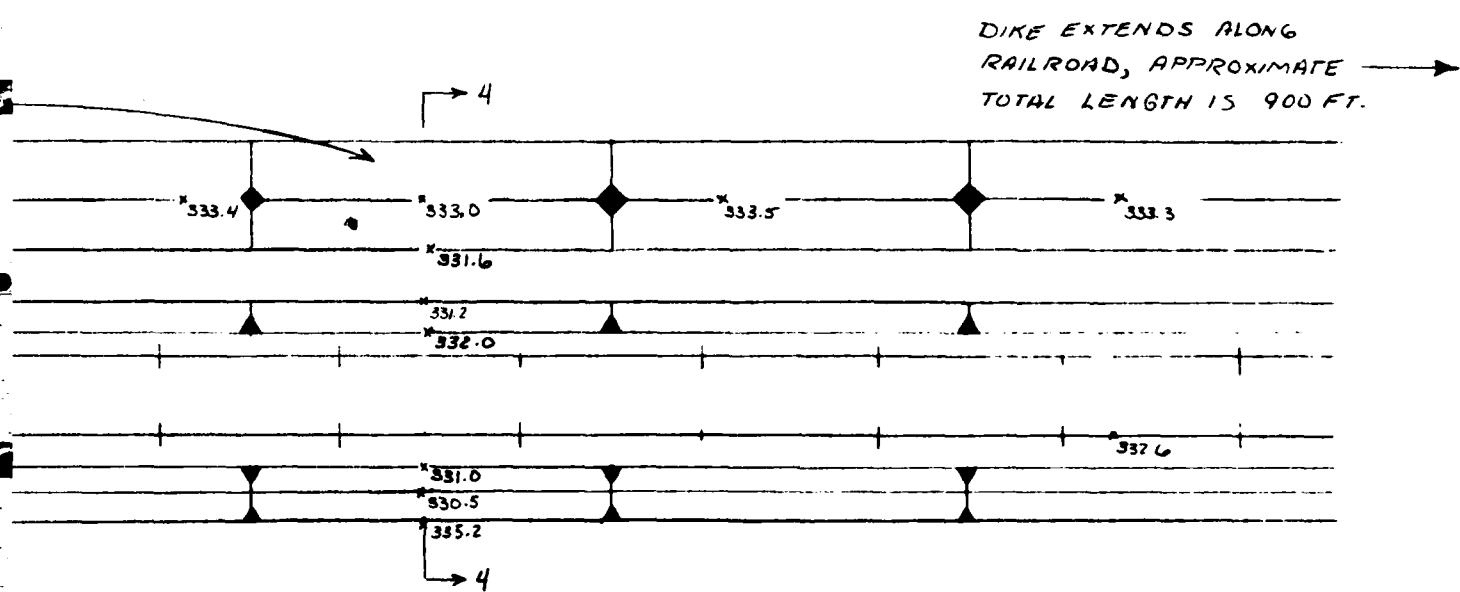


METCALF & EDDY, INC.		U.S. ARMY ENGINEER DIVISION	
BOSTON, MA.		CORPS OF ENGINEERS	
		WALTON, MA.	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
COACHLACE POND DAM			
FIGURE B-2 SECTIONS OF DAM			
TRIBUTARY NARRAGANSETT RIVER		MASSACHUSETTS	
SCALE: 1" = 40'		DATE: OCTOBER, 1978	



Section 4-4

and
5

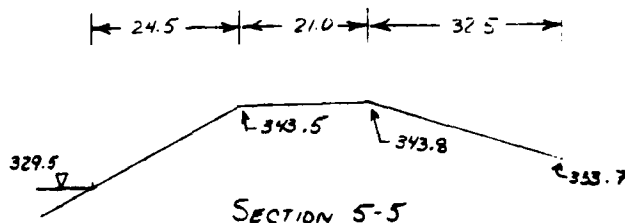
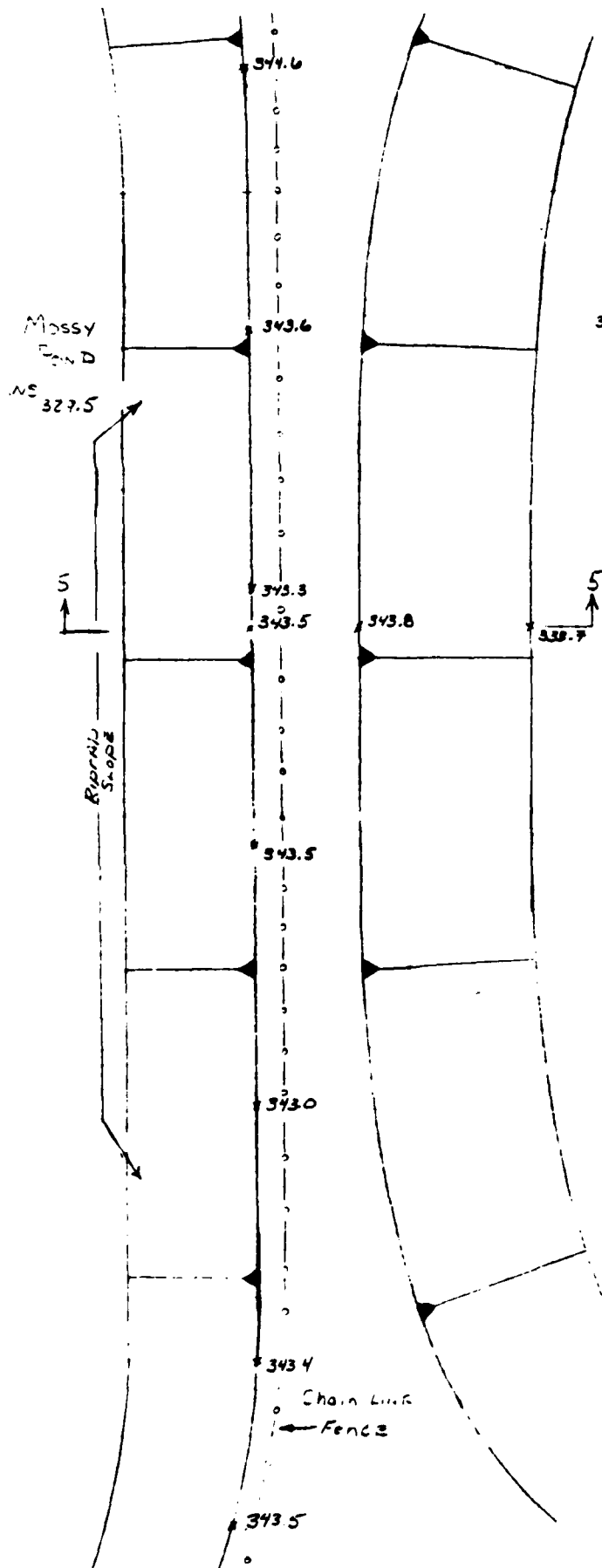


NOTES

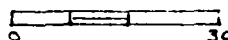
1. Elevations shown based on benchmark
El. 329.5 (MSL) on Spillway Crest. This elevation was
given in a report by Mercier & Eddy, Inc., August 21, 1972
2. Information shown from field survey of
Sept. 7, 1978

METCALF & EDDY, INC. ENGINEERS BOSTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND GROUP OF ENGINEERS BOSTON, MA.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
COACHLACE POND DAM	
FIGURE B-3 PLAN OF DIKE AND SECTION	
TRIBUTARY NASHUA RIVER	MASSACHUSETTS
SCALE: 1" = 80'	DATE: OCTOBER, 1978

3



Scale in Feet



Notes:

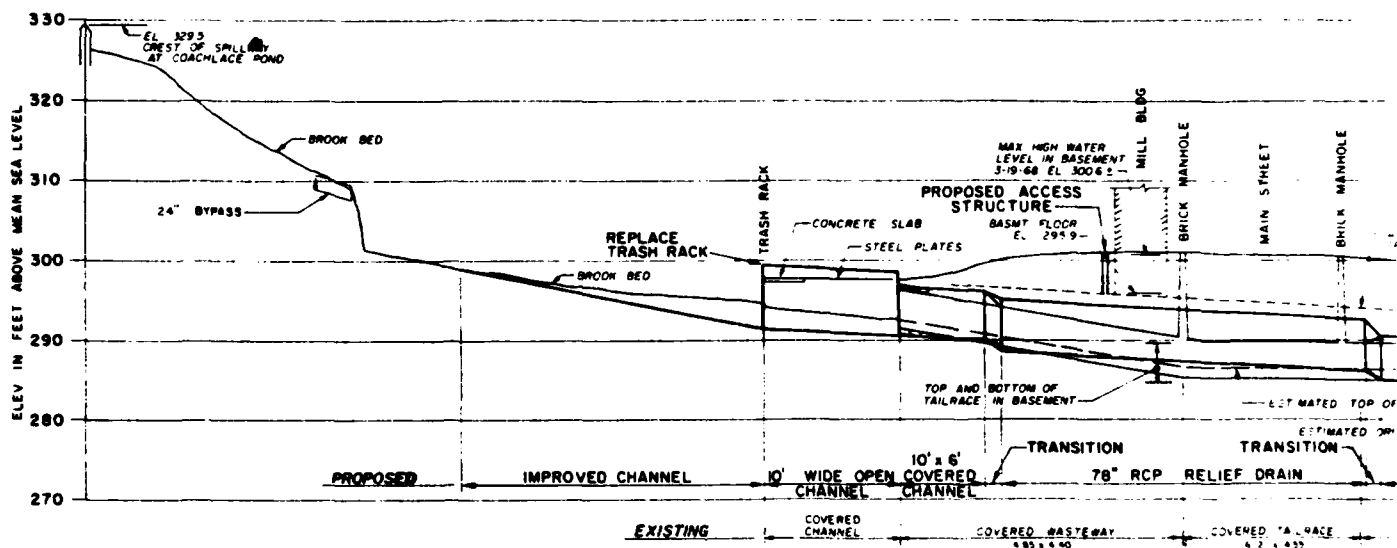
1. Elevations shown based on benchmark, EL. 329.5 on Spillway Crest (See Fig. B-1).
2. Information shown based on field survey of Sept. 7, 1978
3. For location of dam, See Location Map at beginning of report.

NETCALP & EDDY, INC. ENGINEERS CANTON, MA.	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS DALTON, MA.
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	
COACHLACE POND DAM	
FIGURE B-4 MOSSY POND DAM	
TRIBUTARY NADWA RIVER	MASSACHUSETTS
SCALE: 1" = 20'	DATE: OCTOBER, 1978

TOWN OR CITY	DECREE NO.	PLAN NO.	DAM NO.
Clinton			11-03
Coachlacc Pond Dam			C. C. DOCKET NO. 20
Earth-Hy Emb.	Abt = El. 100		Meeting June 1888
DESCRIPTION OF DAM			
Type	Length	Height	
Thickness top	Abt. 20.0		
" bottom			
Downstream Slope			
Upstream			
Length of Spillway	20.0 El. crest = 90.0		
Size of Gates	Flow line = 90.5 (2-36 Pipes)	Yes	
Location of Gates	Right of Dam	Yes	
Flashboards used	Gate Type El. 92.0		
Width Flashboards or Gates			
Dam designed by	Phinehas Ball		
" constructed by			
Year constructed			
GENERAL REMARKS			
Owned by Bigelow - Sanford Carpet Co. 1923			
Inspected: Nov. 19, 1924			
April 14, 1932. L.O.M.			
Oct. 15, 1938 J.C. Powers			
1938 - Owned by Clinton Distilleries			
James Mc Bride - Newton			
1940+ " John Gannon			
Also D. Gannon Standard Borer Co.			
Clinton, Mass			
DESCRIPTION OF RESERVOIR & WATERSHED			
Name of Main Stream	Counterpane Brook	July 11, 1888	
" any other Streams	Stream has been closed in		
Length of Watershed	by owner, no notification C.C.		
Width	M.D.P.W. Dir. W.W. has		
Is Watershed Cultivated	authority		
Percent in Forests			
Steepness of Slope			
Kind of Soil	4.52 Sq M		193.
No. of Acres in Watershed			
" " " Reservoir			
Length of Reservoir			
Width			
Max Flow Cu. Ft per Sec.			
Head or Flashboards-Low Water			
" " " High			
GENERAL REMARKS			
Inspected: Jan. 6, 1939 J.C. Powers			
Dec. 18, 1942. L.H.S.			
June 24, 1947 - L.O.M.			
" 9, 1948 - "			
" Sept. 13, 1949 - "			
" Oct. 30, 1950 - "			

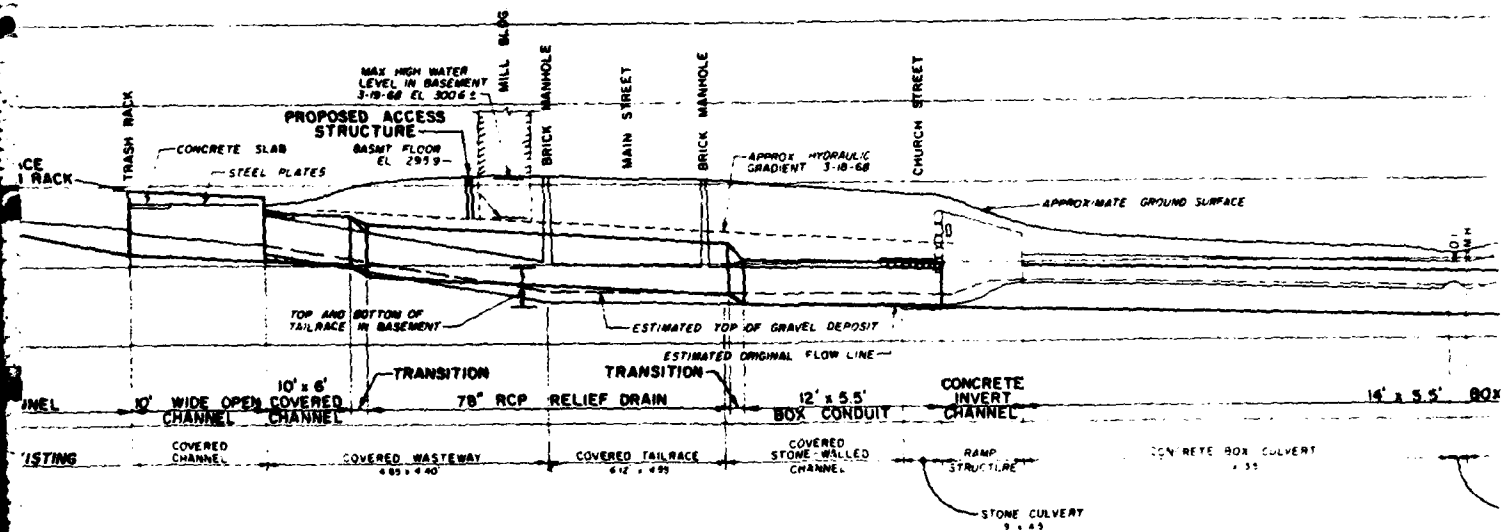
PREVIOUS INSPECTIONS (PARTIAL LISTING)

COPY OF INSPECTION CARD ON FILE AT THE MASSACHUSETTS
DEPARTMENT OF PUBLIC WORKS, DISTRICT OFFICE, WORCESTER.



SCALES HOR. 1"=100'
VERT. 1"=10'





SCALES
 HOR - 1"=100'
 VERT - 1"=10'
 INCHES

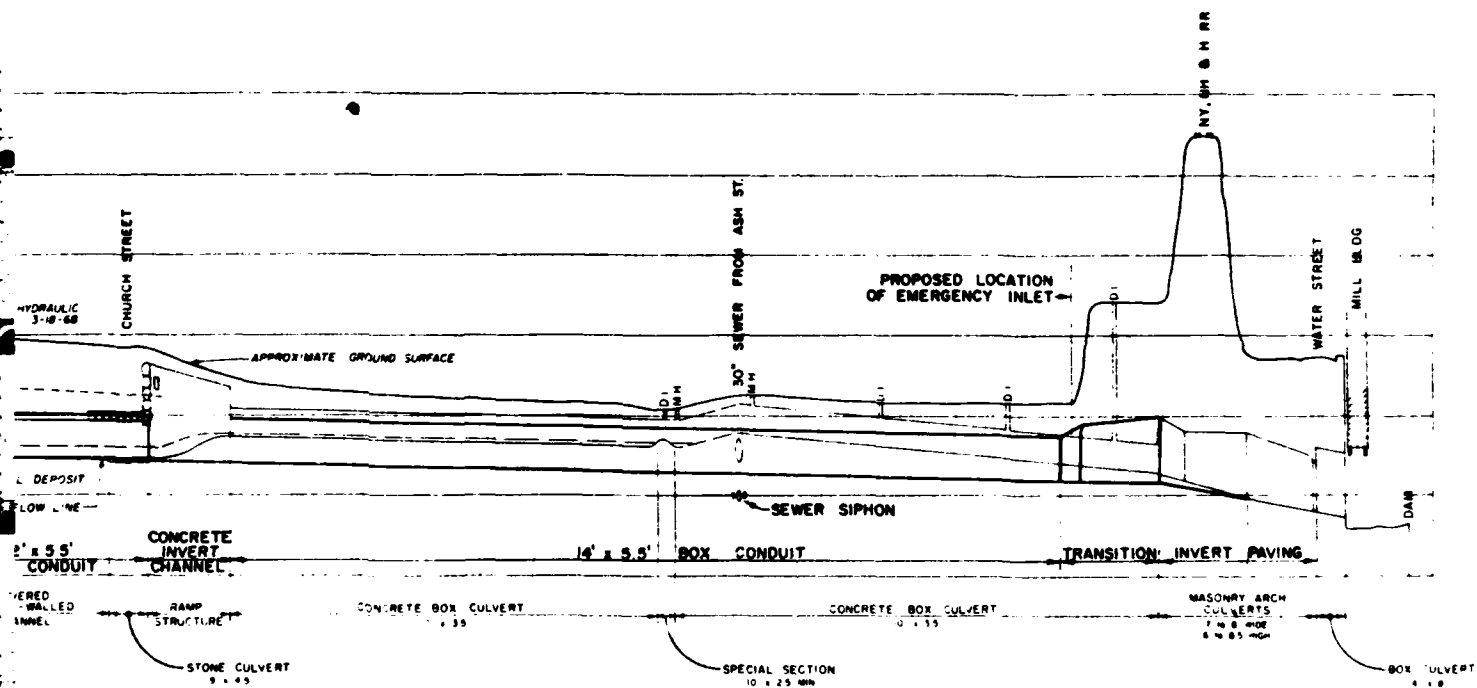
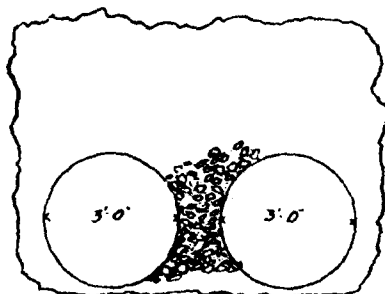


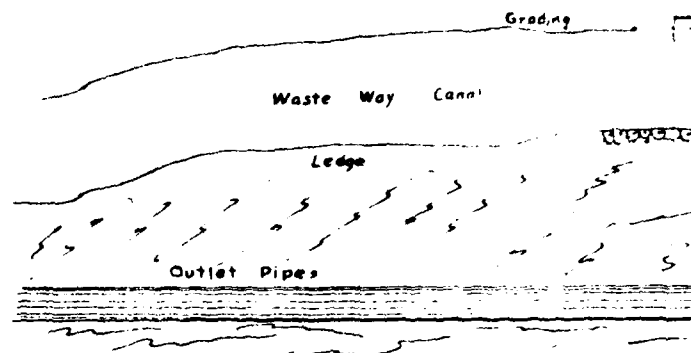
FIG 2-3
 PROFILE OF COUNTERPANE BROOK
 COACHLACE DAM TO MILL DAM
 BELOW WATER STREET

METCALF & EDDY

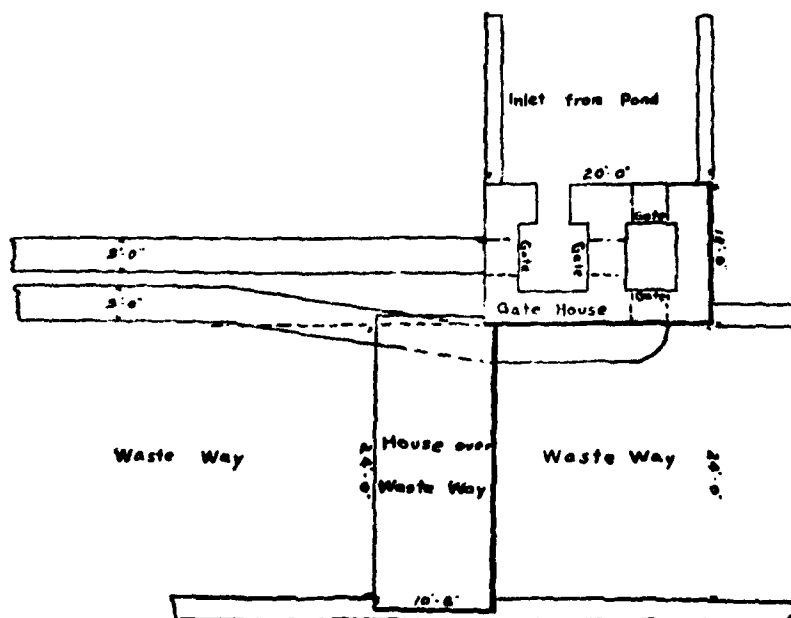
FIGURE B-6



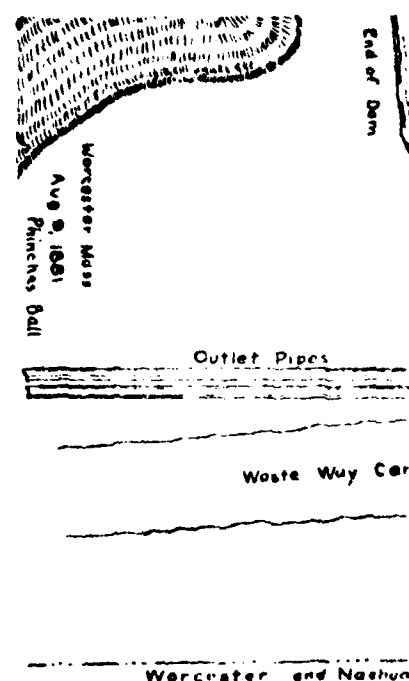
Section of Outlet Pipes and Tunnel

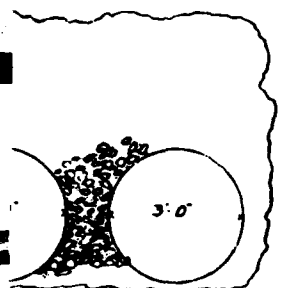


Longitudinal Elevation in Section

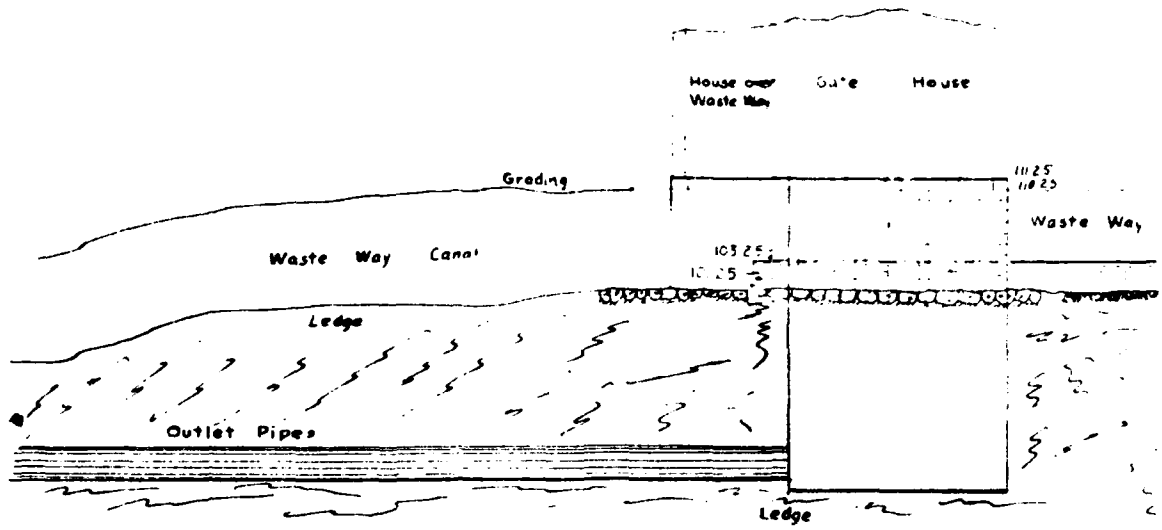


Plan of Gate House and Outlet Pipes
Showing the Relative Location of
the Waste Way

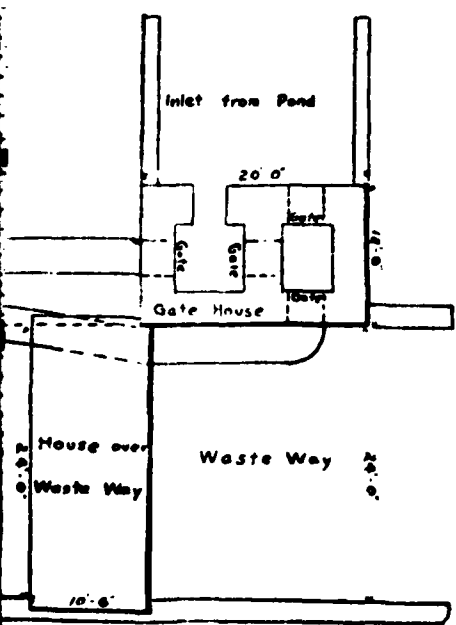




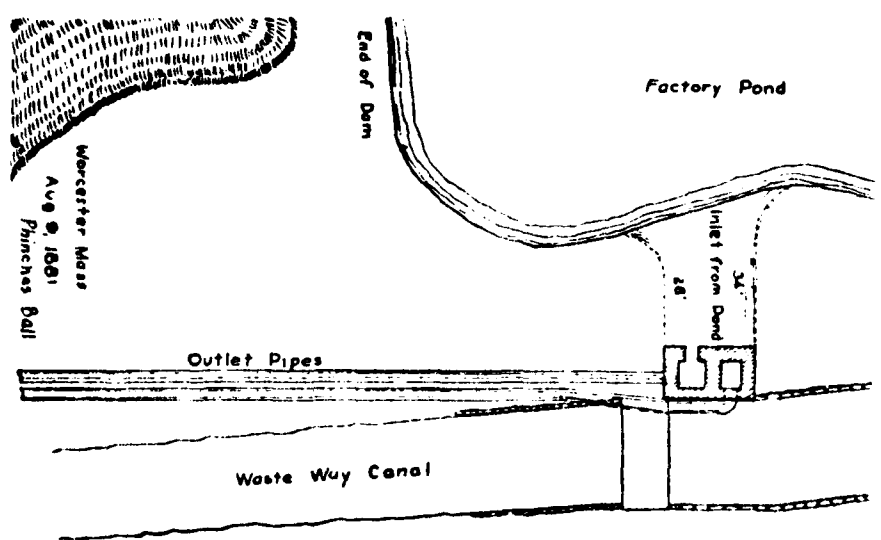
Plan of Outlet Pipes and Tunnel



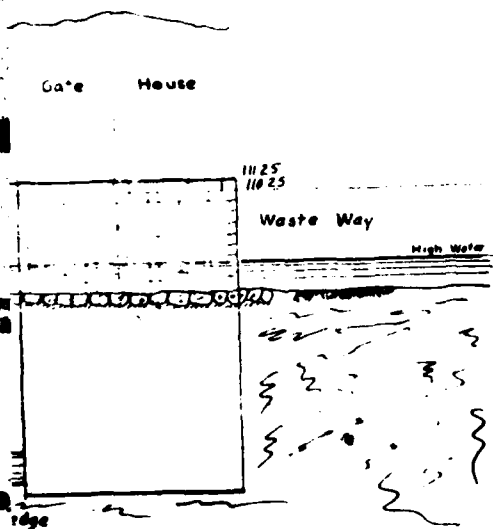
Longitudinal Elevation in Section of Gate House and Waste Way



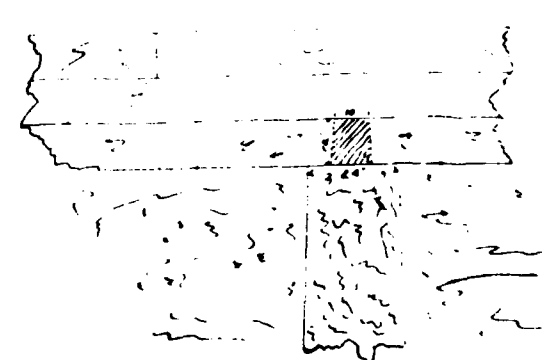
Plan of Gate House and Outlet Pipes showing the Relative Location of the Waste Way



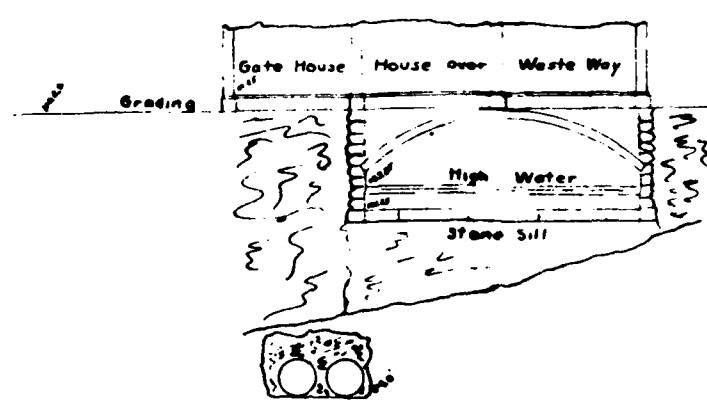
Worcester and Nashua Railroad



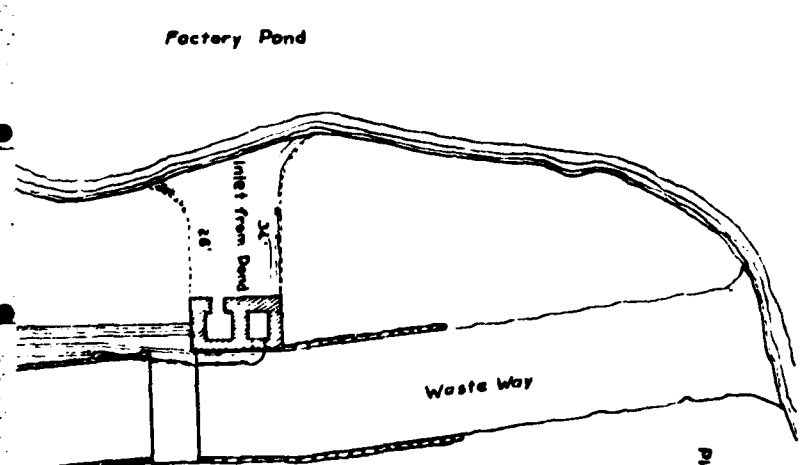
Gate House and Waste Way



Section of Waste Way Sill and Foundation



Sectional Elevation of Waste Way



Plan of Gate House and Outlet Pipe No. 1

NOTE: THIS DRAWING HAS BEEN REDUCED FOR THIS REPORT

WORCESTER COUNTY COMMISSIONERS WORCESTER COUNTY ENGINEERING DEPARTMENT PLAN OF FACTORY (COACHLACE) POND DAM CLINTON, MASS. FOR THE BIGELOW CARPET COMPANY AS FILED AND APPROVED BY THE COUNTY COMMISSIONERS JUNE MEETING SCALES AS NOTED		
TRACED BY <u>JAT</u> TRACING CHECKED BY <u>ST. J.</u>	DAM NO. 11-03	
APPROVED AUG. 9, 1881 BY _____		

TOWN OR CITY	CLINTON	DECREE NO.	PLAN NO.	DAM NO.
LOCATION	Coachlace Pond Dam - Also Mossy Pond & So. Meadow Dam	C. C. DOCKET NO. 70 - June 1888		11-038A
DESCRIPTION OF DAM				
Type	Earth Hy Emb.	Abt El. = 100'0	Name of Main Stream Counterpane Brook	
Length			" " any other Stream Stream has been closed in	
Height			Length of Watershed by owner without notifying	
Thickness top			Width " " County Commissioners.	
" bottom			Is Watershed Cultivated	
Downstream Slope			Percent in Forests	
Upstream			Steepness of Slope	
Length of Spillway = 20'0	El. crest = 90'0		Kind of Soil	
Size of Gates	Flow line = 90.5 - 2-36" Pipes		No. of Acres in Watershed 4.52 Sg M	
Location of Gates	Gate right of Dam.		" " " Reservoir	
Flashboards used	Gate type El. 92.0	Yes.	Length of Reservoir	
Width Flashboards or Gates			Width " "	
Dam designed by	Phinchas Ball		Max Flow Cu. Ft. per Sec.	
" constructed by			Head of Flashboards - Low Water	
Year constructed			" " " High "	
GENERAL REMARKS				
Owned by Bigelow - Sanford Carpet Co. 1933 - Vol. 27 - P. 508 - July 14, 1888				
Inspected Nov. 1924 - April 14, 1932 - Jan. 6, 1938				
Owned by Clinton Distilleries - James Mc Bridges - Newton				
for appointment see Mr. Glavin - Distilleries watchmen - Owned John Gannon				
Standard Brier Co. Clinton, Mass				
Inspected: Jan. 6, 1938 - J.C. Powers				
Also Vol. 26, P. 16 Dec. 16, 1876 - Report on dam by Phinchas Ball				
Vol. 25 - P. 375 - March 1876.				
Inspected: Jan. 6, 1938 - J.C. Powers				
Dec. 18, 1942 - L.H. - 6-24-47 - LOM.				
" 6-9-48 - 9-13-49 & 10-30-1950 LOM				

PREVIOUS INSPECTIONS (PARTIAL LISTING)

COPY OF INSPECTION CARD ON FILE AT THE MASSACHUSETTS

DEPARTMENT OF PUBLIC WORKS, DISTRICT OFFICE, WORCESTER.

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town CLINTON Dam No. 3-14-64-3

Name of Dam COACHLACE POND Inspected by Gene Braden

Date of Inspection Nov. 13, 1973

2. Owner/s per: Assessors _____ Prev. Inspection _____

Reg. of Deeds _____ Pers. Contact ☒

1. LANCASTER ENGINEERING CO. INC. 55 STEELING ST. CLINTON MISS.
Name _____ St. & No. _____ City/Town State Tel. No. _____

2. _____
Name _____ St. & No. _____ City/Town State Tel. No. _____

3. _____
Name _____ St. & No. _____ City/Town State Tel. No. _____

3. Caretaker (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Name: _____ St. & No.: _____

City/Town: _____ State: _____ Tel. No.: _____

4. No. of Pictures taken ✓ _____

5. Degree of Hazard: (if dam should fail completely)*

1. Minor _____ 2. Moderate _____

3. Severe ✓ _____ 4. Disastrous _____

* This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual ✓

Operative ✓ * yes; _____ No. _____

Comments: * 2 of four flashboard assemblies are missing

7. Upstream Face of Dam: Conditions

1. Good ✓ _____ 2. Minor Repairs _____

3. Major Repairs _____ 4. Urgent Repairs _____

onComments:

COACHLACE POND DAM

8. Downstream Face of Dam:

Condition: 1. Good ✓ 2. Minor Repairs _____
3. Major Repairs _____ 4. Urgent Repairs _____

Comments:

9. Emergency Spillway: None

Condition: 1. Good _____ 2. Minor Repairs _____
3. Major Repairs _____ 4. Urgent Repairs _____

Comments:

10. Water Level at time of inspection: 1/2 ft. above ✓ below
top of dam _____ principal spillway ✓
other _____

11. Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment None
Animal Burrows and Washouts None Noted
Damage to slopes or top of dam None
Cracked or Damaged Masonry Yes (see #12)
Evidence of Seepage None Noted
Evidence of Piping None Note
Erosion None Noted
Leaks None
Trash and/or debris impeding flow Yes
Clogged or blocked spillway Spillway partially blocked by debris
Other _____

12. Remarks & Recommendations: (Fully Explain)

GATE house has been seriously damaged by
VANDALS

- 2) 2 of four FLASH BOARD assemblies have been removed and should be replaced
- 3) SPILLWAY RETAINING WALLS ARE IN NEED of some REPAIRS - GROUTING, and POINTING

The dam itself is safe but UNDER PRESENT conditions there is NO WAY to control the impounded water because of the missing flash-boards at the spillway. This condition should be corrected because there is serious DANGER of severe flood conditions in the event of heavy & protracted RAINFALL

13. Overall Conditions:

1. Safe _____
2. Minor repairs needed _____
3. Conditionally safe - ^{IMMEDIATE} ~~major~~ repairs needed ☒ _____
4. Unsafe _____
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____

COACHLACE POND DAM

DESCRIPTION OF DAM

DISTRICT 3

Submitted by Gene Brodeur Dam No. 3-14-64-3

Date Nov. 13 1973 City/Town CLINTON

Name of Dam COACHLACE POND

1. Location: Topo Sheet No. 23 A

Provide 8 1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year built: 1881 Year/s of subsequent repairs _____

3. Purpose of Dam: Water Supply ☒ Recreational _____

Irrigation _____ Other _____

4. Drainage Area: 4.4 sq. mi. _____ acres

5. Normal Ponding Area: 40 acres; Ave. depth _____

Impoundments: _____ gals.; _____ acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir

1 i.e. summer homes, etc. ☒

7. Dimensions of Dam: Length 250' Max. Height 8'

Slopes: Upstream Face 2:1

Downstream Face 6:1

Width across top 18' to 40'

8. Classification of Dam by Material:

Earth ☒ Conc. Masonry _____ Stone Masonry ☒

Timber _____ Rockfill _____ Other _____

9. A. Description of present land usage downstream of dam:

10% % rural; 90% % urban.

B. Is there a storage area or flood plain downstream of dam which could accomodate the impoundment in the event of a complete dam failure? yes _____ no ☒

IMPROVING flood conditions in Counterpane
Brook in the town of Clinton
M & T

COACHLACE POND DAM

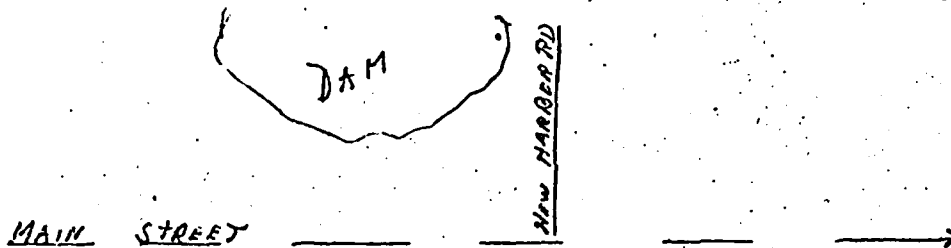
DAM NO. 3-14-64-3

10. Risk to life and property in event of complete failure.

No. of people 1000±
No. of homes 100±
No. of Businesses 25±
No. of industries 20± Type Light (VARIOUS)
No. of utilities 5 Type SEWER, WATER, GAS, TEL., ELEC.
Railroads 1
Other dams None
Other _____

11. Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

12. How to Locate: 0.1 mi NEly of MAIN ST. ON NEW HARBOR RD



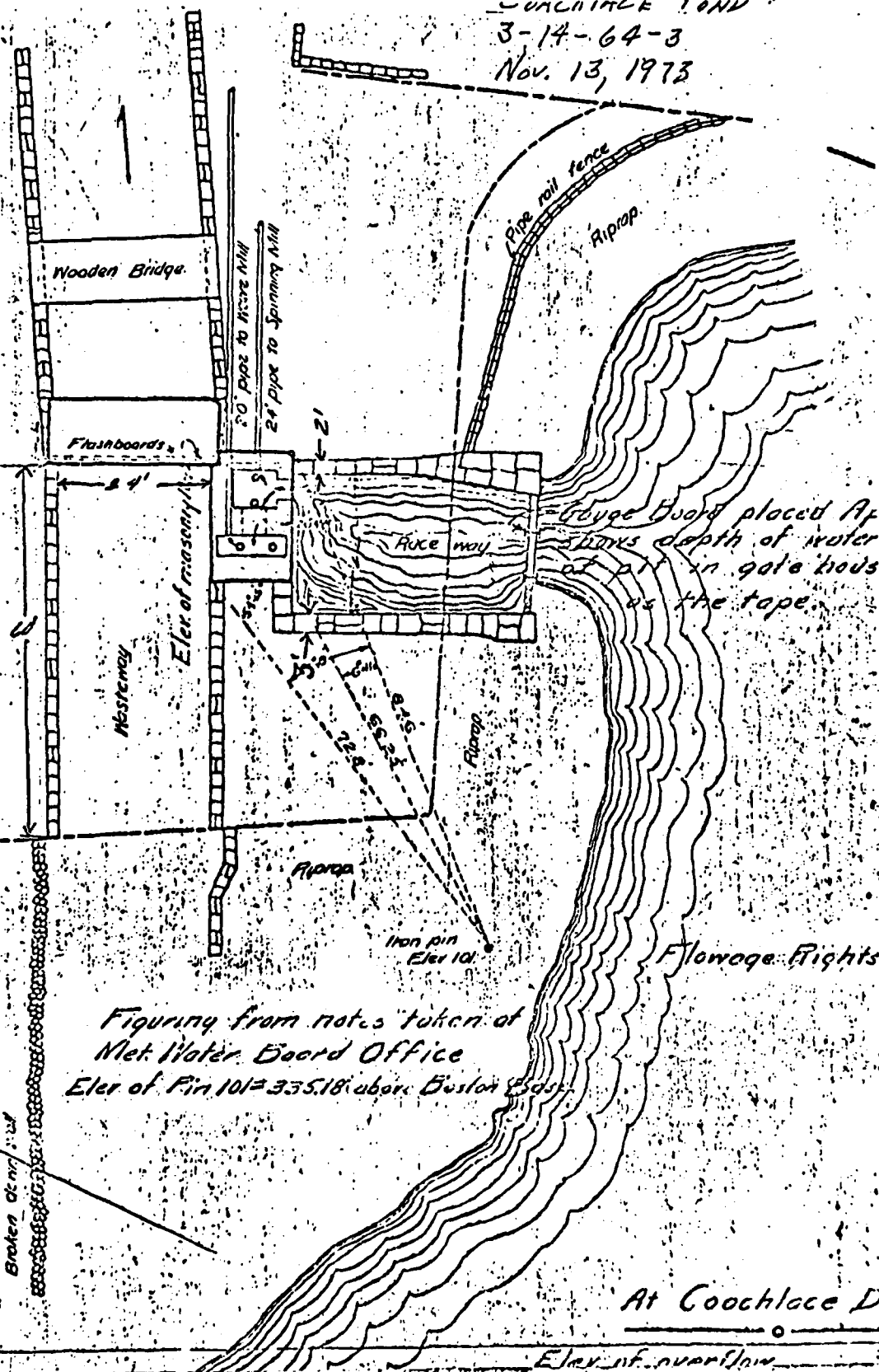
COACHLACE POND DAM

CLINTON

COACHLACE POND

3-14-64-3

Nov. 13, 1973

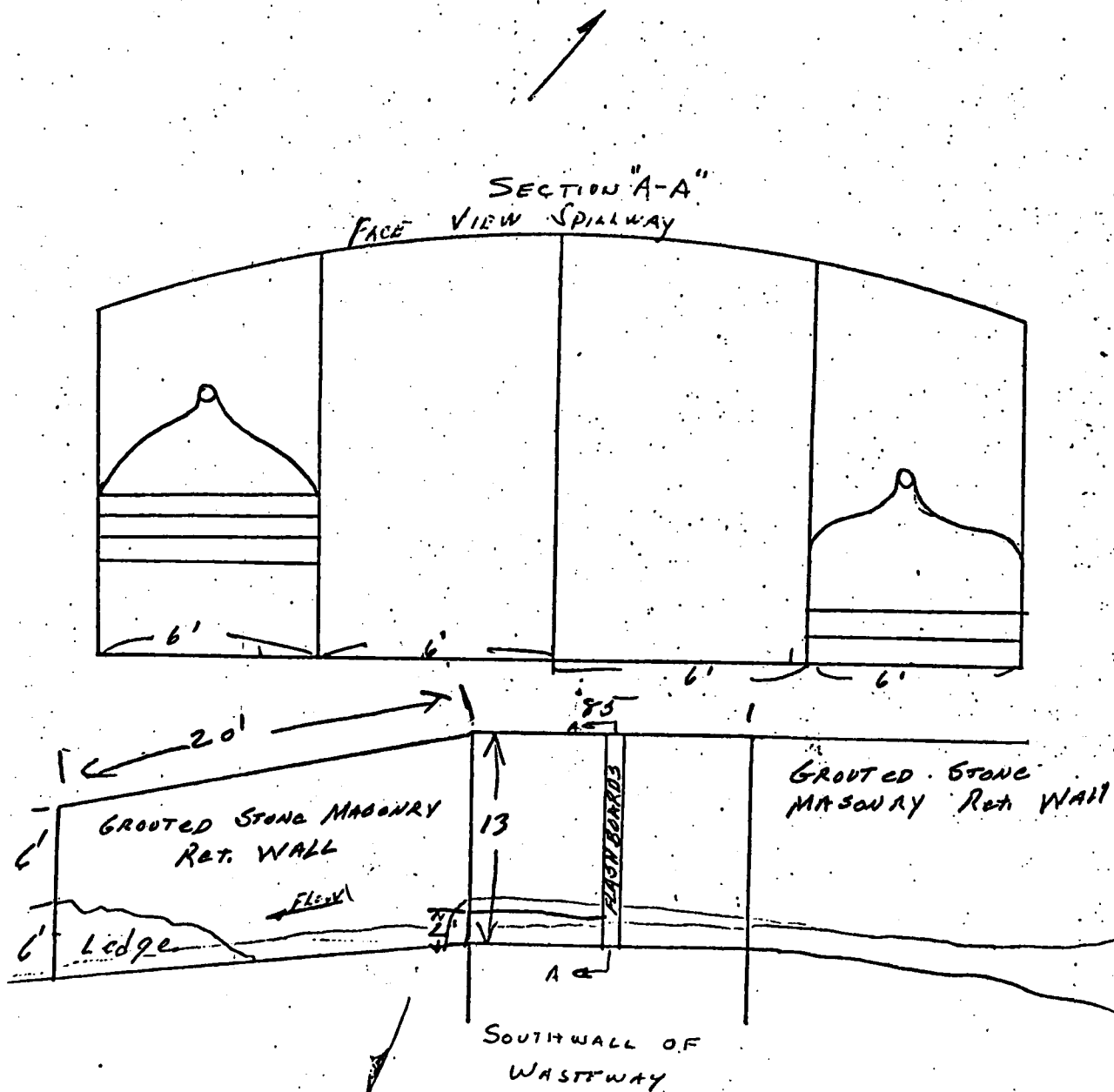


Figuring from notes taken at
Met. Water Board Office
Elev of Pin 101 = 335.18 above Boston Base

At Coachlace D

Elev. of overflow
COACHLACE POND DAM

CLINTON
COACHLACE POND
3-14-64-3
Nov 13, 1973



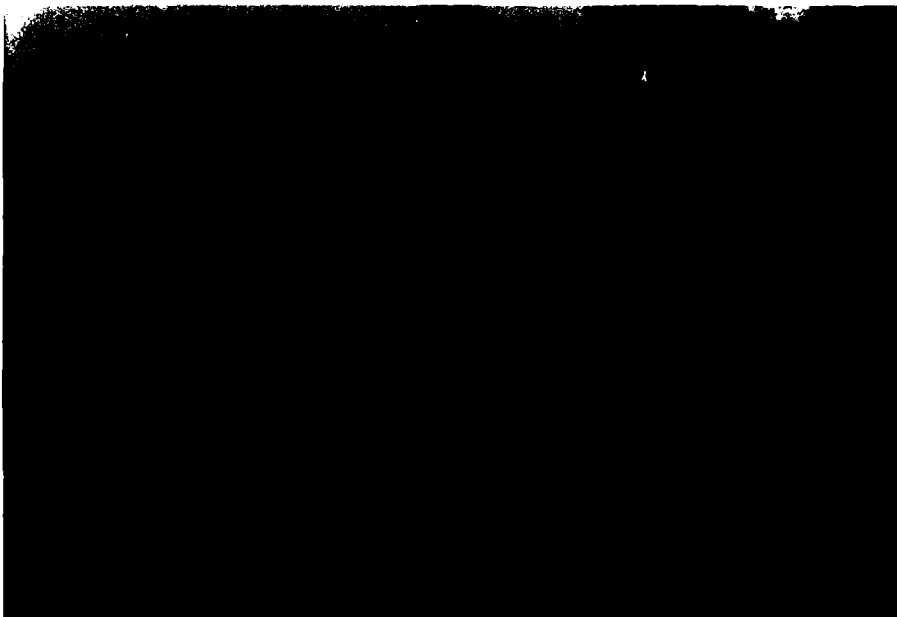
COACHLACE POND DAM

APPENDIX C
PHOTOGRAPHS

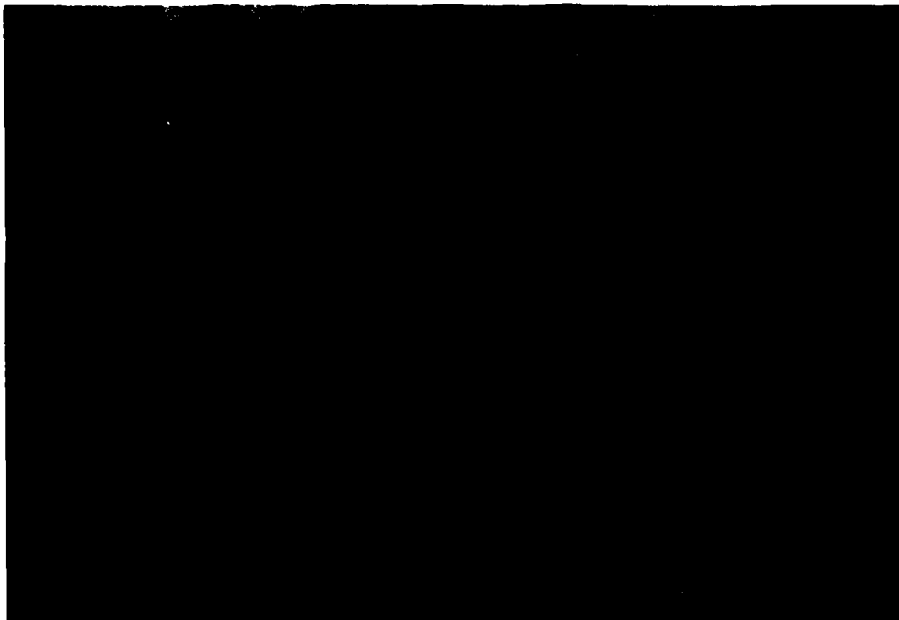
COACHLACE POND DAM



NO. 1 VIEW OF CREST OF DAM FROM SOUTH ABUTMENT



**NO. 2 VIEW LOOKING UPSTREAM SHOWING SPILLWAY WITH
SERVICE HOUSE AND GATE HOUSE ON LEFT**



NO. 3 VIEW OF INLET TO GATE HOUSE



NO. 4 VIEW OF SPILLWAY



**NO. 5 VIEW LOOKING UPSTREAM SHOWING
CHANNEL BELOW SPILLWAY**



**NO. 6 VIEW LOOKING DOWNSTREAM SHOWING
CHANNEL BELOW SPILLWAY**

APPENDIX D

Figure D-1, Drainage Area Map

Page

D-1

Hydrologic and Hydraulic Computations

D-2

COACHLACE POND DAM

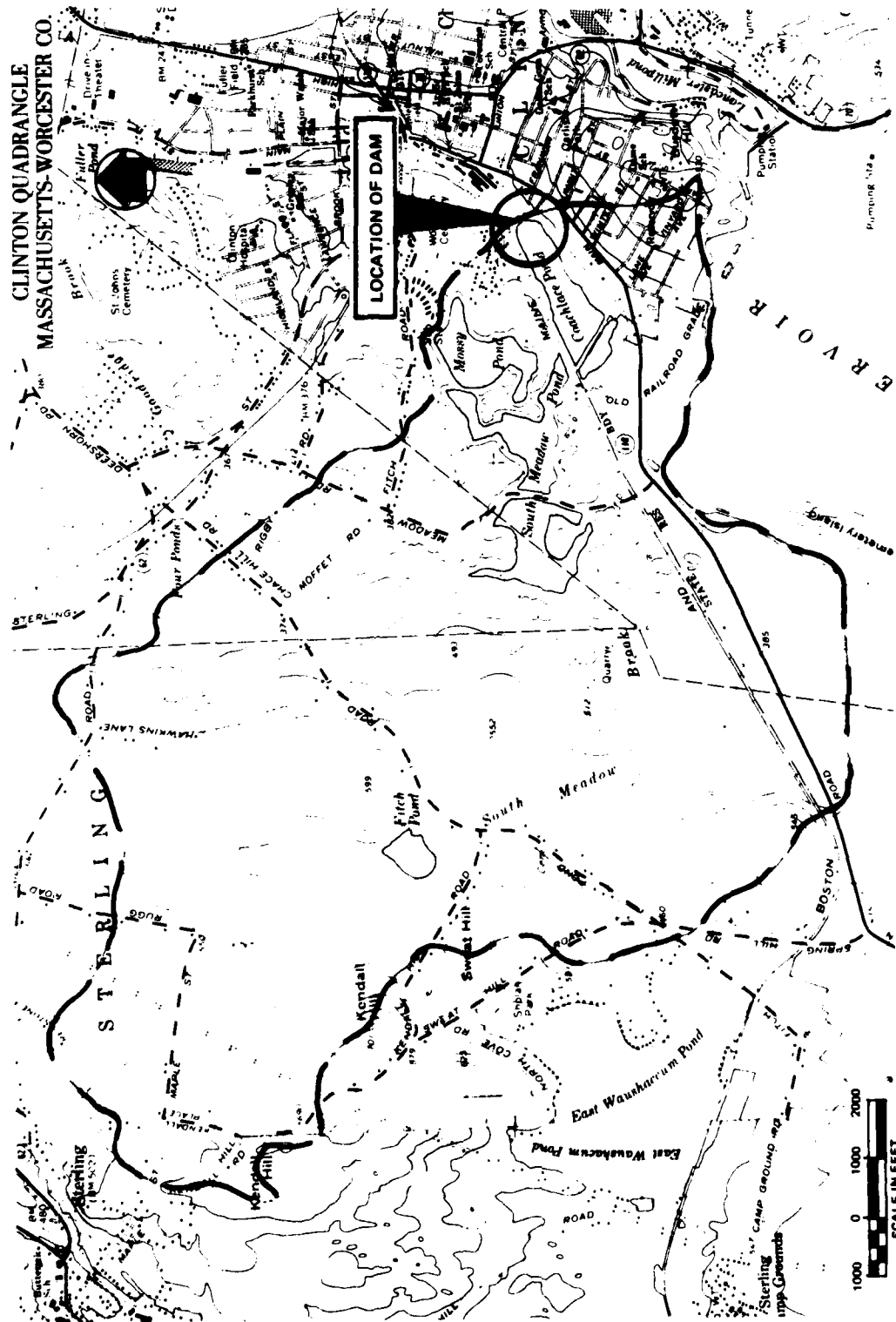


FIG. D-1 DRAINAGE AREA MAP - COACHLACE POND DAM

I Test Flood, 100 year storm & Storage Functions

1- Total Drainage Area - 4.51 mi²

2- Pond(s) Area: $0.21 + 0.02 = 0.23 \text{ mi}^2$
 Swamp(s) Area: $0.12 = 0.12 \text{ "}$
Total Area Ponds & Swamps: 0.35 mi²

% Ponds & Swamps = $\frac{0.35}{4.51} = 7.7\%$

3- $\frac{17.690 - 328}{L: 15100'} = .02397$ } Say Ave Slope = 2.5%

4- Using C. of E. Curves for Peak Flow Rates & above guide values the Peak Flow Rate was estimated to be between "Rolling" and "Flat & Coastal" and taken at 1450 c.f.s./mi²
 Size Class: Small ; Hazard Pot.: Significant; Spill. Des. Flood: 1/2 PMF
 Use: Test Flood = 1/2 PMF

5- Test Flood Inflow = $\frac{1}{2}(1450) 4.51 = 3270 \text{ c.f.s.}$

6- Pond Storage

The ponds area is 0.21 sq. mi. at elev. 329.5.
 Based on a const. area, storage increases at 134 ac. feet per foot of depth increase.
 At elev. 3360, the volume stored above the spillway crest is 871 acre feet.

7- Storage Functions are based on $Q_{out} = Q_{in} \left[1 - \frac{S_{out}}{R} \right]$

S_{out} = Storage Vol. in Reservoir related to final Q_{out}
 in terms of inches of rain over the drainage area.

$S(\text{in Inches}) = 12 D \left(\frac{0.21}{4.51} \right) = 0.56 D$; $R = 6 \text{ hr rain of storm}$

D = Storage Depth (above spillway) on reservoir, in feet.

8- Storage Functions: (F_{TF}) ; $D = 0$ @ Pond El. 329.5

$$F_{TF} = 3270 - 344 S = 3270 - 193 D$$

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II Discharge Ratings A-Spillway

[Ref. "Hydr. Tables" by Williams & Hazen]
 Use Disch. w/ $P=2'$. Add Vel. Hd. to depth for Pond Level
 Crest Elev. @ 329.5
 Net width of spillway = 21.65' in 4 bays, Thus 5.41' per bay
 For side contr. use width of 5' per bay or 20' clear.

y	g	Q_5	h_v	Pond Elev. ($329.5 + y + h_v$)
2	10.6	212	0.4	331.9
3	20.4	408	0.7	333.2
4	32.5	650	1.0	334.5
5	46.7	934	1.3	335.8
6	62.8	1256	1.7	337.2
5.2	49.8	996	1.4	336.1

B- R.R. Dike Flow

Total Dike Length - 900'; Surveyed Length 350' ±

Elevation: 333.0; 333.1; 333.3; 333.4; 333.5; 333.7; 334.5; 334.6; 334.8 333.2
 Surv. length: 45 15 60 40 55 45 20 25 15 40
 Est Total length: 116 39 154 103 141 116 51 64 39 103

Use $Q_0 = 2.55 H^{1.5}$ $155' @ 333$ $360' @ 333.3$ $257' @ 333.6$ $154' @ 334.6$
 Q_1 Q_2 Q_3 Q_4

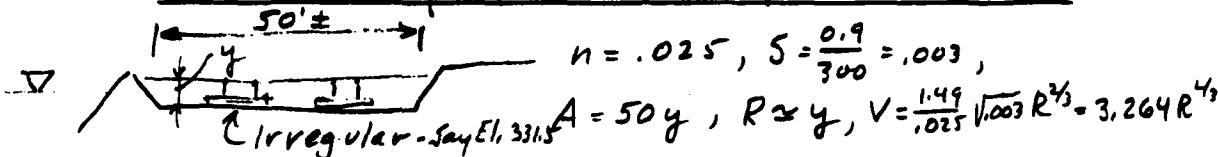
Pond El.	333.3	333.6	334
Q_1	65	184	395
Q_2	—	151	588
Q_3	—	—	166
Q_4	—	—	—

ΣQ_0 65 335 1099*

* R.R. R.O.W. Controls discharge at higher pond levels

II Discharge Ratings

C - Capacity of RR R.O.W. for Water Flow

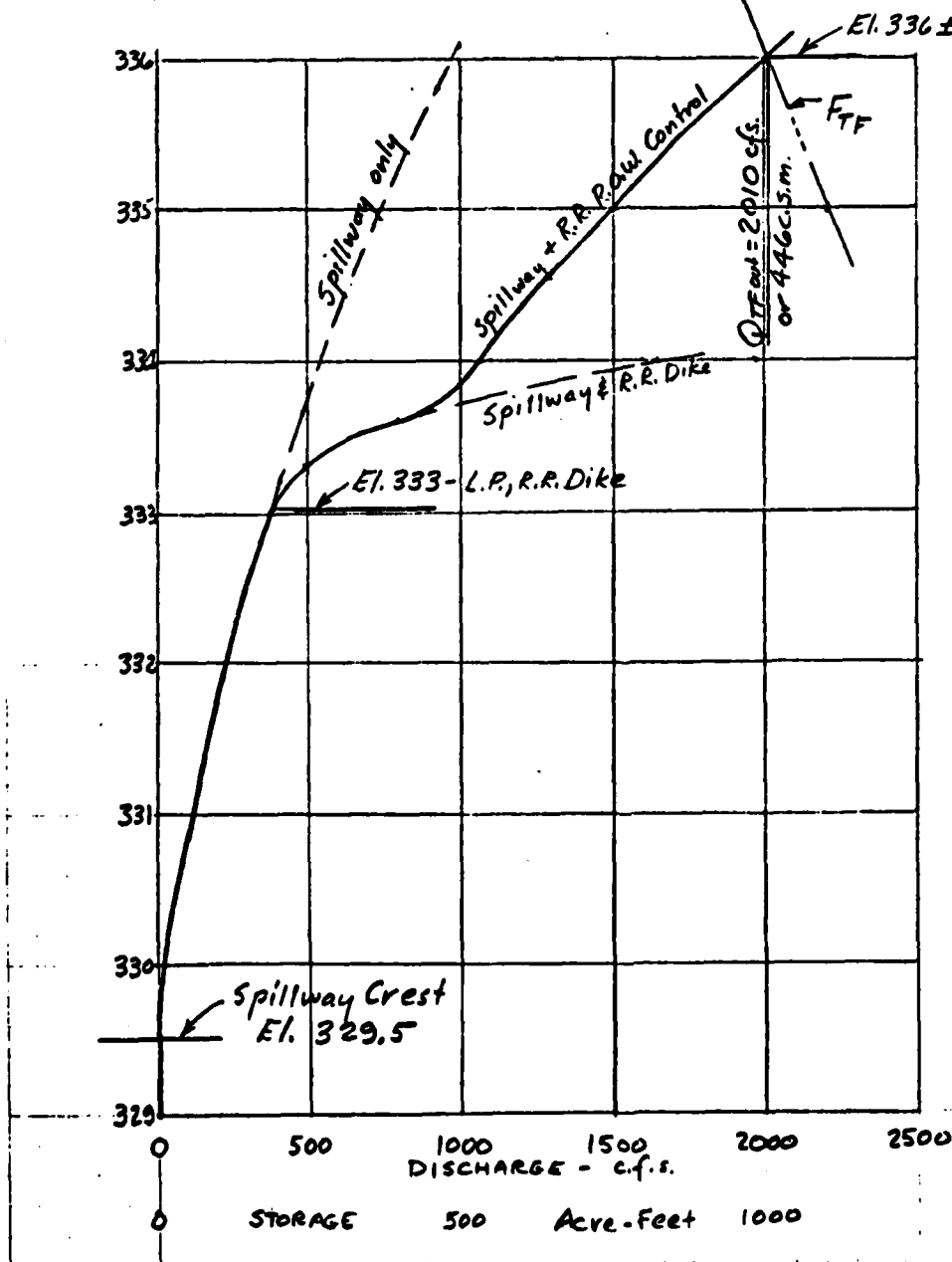


y	A	$R^{2/3}$	V	Q_c	± Water El.	Min Pond El.
0.5	25	0.63	2.06	57	332	N.A.
1.0	50	1.00	3.26	163	332.5	N.A.
1.5	75	1.31	4.28	320	333	N.A.
2.0	100	1.59	5.18	518	333.5	334 ±
2.5	125	1.84	6.01	752	334	335 ±
3.0	150	2.08	6.79	1018	334.5	336 ±

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III Discharge, Storage & Storage Function vs. Pond Elevation

Note: Low Pt. on Crest of Main Dam - El. 339.6
 Low Pt. on Mossy Pond Dike - El. 343 ±



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(IV) Results

A- Crest Flow

The only crest flow due to the Test Flood is over the low dike parallel to the railroad

Max Pond Elev - 336.0

Min Dike Elev - 333.0

Crest Head - 3.0

$$q = (3.0)^{1.5} (2.55) = 13 \text{ cfs}$$

Under Critical Flow Conditions: $y_c = 1.8$; $V_c = 7.4$ fps.

B- Dam/Dike Failure

Max Depth before overtopping RR dike is elev. 333.0

Dnstr. toe of main dam is elev. 333.9

Dnstr. toe of Mossy Pond dike is elev. 333.7

R.R. Dike Failure flow is restricted by railroad R.O.W.

No dam failure evaluation seems reasonable

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS

COACHLACE POND DAM



INVENTORY OF DAMS IN THE UNITED STATES

1. AGENCY DIVISION	2. STATE	3. COUNTY	4. DIST.	5. NAME	6. LATITUDE (NORTH)	7. LONGITUDE (WEST)	8. REPORT DATE DAY MO YR
MA 100 NED	MA	027	03	COACHLACE POND DAM	4224.9	7141.6	17 NOV 78

9. POPULAR NAME	10. NAME OF IMPOUNDMENT			
	COACHLACE POND			
11. RE-IMP. BASIN	12. RIVER OR STREAM	13. NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	14. DIST FROM DAM (MI.)	15. POPULATION
05	COUNTERPANE BROOK	THOMASVILLE CLINTON	0	13000

16. TYPE OF DAM	17. YEAR COMPLETED	18. PURPOSES	19. SURFACE HYDRAULIC HEIGHT (FT.)	20. IMPOUNDING CAPACITIES (ACR.)	21. DIST OAN FLD H	22. PKV/FED	23. SCS A	24. VER/DATE
1	1946	S	13	13 196 56	N	N	N	4 DEC 78

25. REMARKS											
26. D/S HAS											
1	400	U	22	340	21000	INSTALLED PROPOSED	NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)

27. OWNER	28. ENGINEERING BY	29. CONSTRUCTION BY
LANCASTER ENGINEERING CO	UNKNOWN	UNKNOWN

30. REGULATORY AGENCY	
DESIGN	CONSTRUCTION
NONE	NONE

31. INSPECTION BY		32. INSPECTION DATE DAY MO YR		33. AUTHORITY FOR INSPECTION	
METCALF & EDDY, INC.		07 SEP 78		PUBLIC LAW 92-367	

34. REMARKS	

END

FILMED

10-84

DTIC